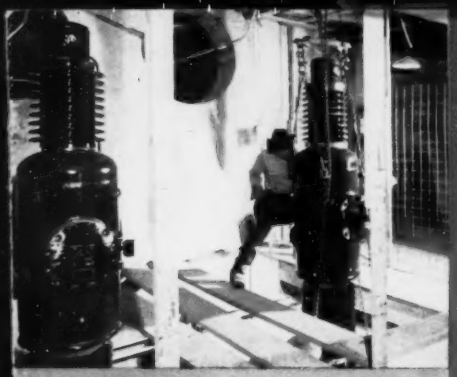

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ELECTRICAL WEST

May 1958
50 Cents

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U. S.

Water Supply Outlook for the West 71

Low Bidding — Cause and Cure . . 80

What About Panelboards? 83

Enter Kwh Rodeo 109

Will your new home be electrically obsolete the day you move in?

Astonishingly enough, two out of three homes being built today do not provide the modern electric appliances people want most. Worse than that, in most cases no wiring provision is made for their eventual installation. These "new homes" are electrically obsolete the day you buy them.

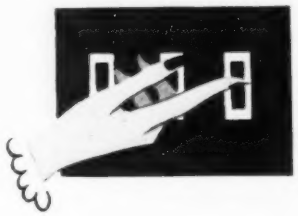
Yet it costs so very little to enjoy the enormous convenience these labor saving appliances bring you – especially when they're built-in to the home or provided for when the house is still in the planning stage.

Now – a new service has been inaugurated that tells you whether the home you're about to buy is truly modern. Electric utility experts work with leading builders when their homes are still in the planning stage – to let you enjoy modern electric living *the day you move in*. Then, and only then, are these homes awarded the nationally famous "Medallion Home" Award.

Here's what the "Medallion Home" Award tells you about the home you're about to buy:

1. Your most-needed electric appliances will be already installed!

"Medallion Homes" come equipped with an ultra-modern electric range *built-in* – as well as at least three other major appliances. What's more, wiring for future needs is in and paid for.



2. The home is properly wired for "Full Housepower"

It has plenty of outlets and switches in *convenient* locations. It has enough separate circuits for proper and efficient power distribution – and provision for extra circuits you may need later on.

3. The home has "light for living"

Every "Medallion Home" has provisions for fixtures that beautify and illuminate – and light such important areas as the kitchen sink, bathroom shower and mirror, and outside each entry to the home.

Look for the nationally known "Medallion Home" Award

It's your guarantee that the home meets the rigid standards of the 1958 Live Better Electrically Medallion Home Program to let you live better electrically, today and tomorrow!

SOUTHERN CALIFORNIA Edison COMPANY *helps you* LIVE BETTER—ELECTRICALLY

PERFECT VISION
for commercial fluorescent applications
when you think of lighting
think of SMOOT-HOLMAN
PERFECT VISION Luminaires combine attractive styling with even light distribution and high efficiency . . . easier hanging and lamping. The design has been copied, but not the lighting performance. Insist on the genuine, original PERFECT VISION Luminaire. Be sure it carries the SMOOT-HOLMAN label!
Write for brochure with performance data
SMOOT-HOLMAN COMPANY, Inglewood, California
tomorrow's lighting today

ELECTRICAL WEST

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U.S. Established 1887

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GATE HOUSE at entrance to Indian Lake Estates, country club community, with the professionally styled L-M Ovalite (Line 2A) mercury vapor luminaires mounted on double upsweep arms to light the dual-lane avenues. These provide uniform illumination of 4.2 footcandles on the roadways. Lights are turned on and off automatically by L-M photoelectric relays.

L-M Luminaires Light Florida's Beautiful Indian Lake Estates

High in the lake and ridge section of Florida, in the area around Lake Wales, is located a new private city, Indian Lake Estates. This is a multi-million dollar development, an exclusive country club community, providing exceptional beauty and outstanding recreational facilities for residents.

Lighting the palm-lined, dual-lane avenues are L-M Ovalite (Line 2A) mercury vapor luminaires. These luminaires, mounted on metal poles at 30 feet, have dual 8-foot upsweep arms. They carry 20,000 lumen lamps and provide uniform illumination of 4.2 footcandles on the roadways. Underground 240-volt wiring serves the luminaires, which are controlled by photoelectric relays.

In addition, a 1,100-foot private pier is lighted with L-M's famous Suburbanaire (Line 2B) open type units containing 175-watt mercury lamps and ballast. They are spaced at approximately 100-foot intervals along the pier and provide 2.0 footcandles of illumination.

Ovalite An Efficient Light Source

The Line 2A luminaires have a high coefficient of utilization. Additional advantages include: choice of Type II, III, or IV light distribution patterns, by simply changing lamps or socket settings; many features for safety and easy servicing, including L-M's exclusive "service-safe" socket; choice of series or multiple service.

Get Complete Information

L-M provides a complete, highly styled lighting line of incandescent, mercury vapor, and fluorescent units, with excellent application engineering help for utilities, municipalities, consultants and subdividers. Ask the L-M Field Engineer or Lighting Engineer about L-M outdoor lighting equipment. Or write Line Material Industries, Milwaukee 1, Wis. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.

331-R

LINE MATERIAL Industries Outdoor Lighting

McGRAW-EDISON COMPANY

Field experience proves performance advantages of Preformed splices

In hundreds of thousands of applications, only one failure of a Preformed splice has been reported—and that was caused by inadequate preparation of a heavily corroded conductor.

This distinctive performance is the result of soundly engineered features: (1) uniform radial pressure of the splice rods; (2) full area of contact; (3) the flexibility of the rods which causes the grit particles to penetrate existing oxides and establish permanent electrical contact with the conductor; and (4) the inherent resiliency of the splice which maintains consistent surface contact with the conductor throughout extremes of line tension and temperature variation. These combined characteristics are your assurance of unfaltering mechanical and electrical performance at all times.

And, most important, no tools are needed to install a Preformed splice; the application is made entirely by hand and takes but a fraction of the time required for other types of splices.

There are Preformed splices to solve almost every splicing problem. They can be furnished to hold the full-rated strength of any standard transmission or distribution conductor.

Write for additional technical information. PREFORMED LINE PRODUCTS COMPANY, 5349 St. Clair Avenue, Cleveland 3, Ohio. Cable Address: Preformed-Cleveland . . . manufacturer of armor rods, dead-ends, Guy-Grip dead-ends and other line accessories.

PLP

10 YEARS OF Power Line Progress

You can look up to **Preformed**

Made in accordance with or for use under U.S. Patent Nos. 2,609,653; 2,275,019; 2,587,521; and 2,691,685. Other patents pending.

Planning Ahead in Building the West

Schools: Orange, Calif., $2,500,000; Desert Lake and Boron, Calif., $800,000; Redwood City, Calif., $3,448,000; Bellevue, Wash., $2,265,385; Lovington, N. M., $775,000; Los Angeles, more than $8,000,000; Boulder, Colo., $1,500,000.

Medical center for Stanford University School of Medicine, Palo Alto, Calif., $14,000,000.

Department store for San Diego, $15,000,000.

University of Oregon science building at Eugene, $1,315,000.

Oregon State College mechanical engineering building at Corvallis, $1,055,000.

Dormitory building for Boise Junior College, $600,000.

Addition to guided missile manufacturing plant, Salt Lake City, $2,000,000.

Hotel near International Airport, Oakland, Calif., $1,500,000; hotel in San Francisco, $20,000,000.

Bonds voted for street lighting system, $1,040,000; high school, $2,813,000, Tacoma, Wash.

Bonds and special levy for high school, Everett, Wash., $2,400,000.

Junior College addition at Bremerton, Wash., $787,400.

Bank building at Ogden, Utah, $1,000,000.

Forestry building at Utah State University, Provo, $2,250,000.

International Airport improvements, Portland, $1,648,572.

Division of Highways office addition, San Bernardino, Calif., $1,700,000.

Scottish Rite Temple, San Francisco, $2,500,000.

Astronomical observatory on Kitt Peak, Ariz., $3,000,000.

Freight terminal at Portland, Ore., $2,000,000.

Latter-day Saints Tabernacle at Seattle, Wash., $1,000,000.

Hospitals: Ogden, Utah, $5,000,000; Mountain View, Calif., $7,260,000; Rupert, Idaho, $400,000; Los Angeles, $2,235,470.

Housing units: Renton, Wash., $1,000,000; Mountlake, Wash., $1,300,000; Sausalito, Calif., $4,500,000; Corvallis, Ore., $2,500,000.

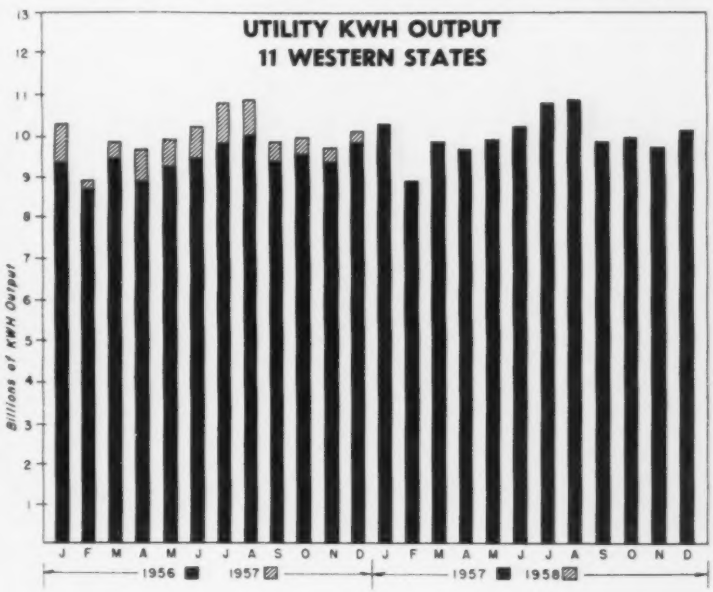
Gas transmission lines for Salt Lake City, $26,000,000.

Shopping center at Daly City, Calif., $25,000,000.

Manufacturing plant in Phoenix, Ariz., $3,000,000.

City Hall for San Mateo, Calif., $823,500.

----How're We Doing?


UTILITY KWH OUTPUT
11 WESTERN STATES
Billions of KWH Output
1 2 3 4 5 6 7 8 9 10 11 12 13
J F M A M J J A S O N D J F M A M J J A S O N D
1956
1957
1957
1958

Output Comparisons

Year-to-year Kwh Output Changes in Western Regions and U. S.
Per Cent Changes Over Same Week One Year Ago

Week Ending	Rocky Mountain	Pacific Southwest	Pacific Northwest	U. S. Total
March 8	+6.0	+2.0	+2.3	+0.1
March 15	+3.1	+2.6	+4.2	−0.6
March 22	+6.5	+4.5	+1.9	+1.8
March 29	+0.8	+0.5	−0.6	+0.3

Spring Rebound?

Home buying plans showed a brisk pickup in March, according to the Federal Housing Administration. Applications for insurance on new dwellings increased more than 10% over March 1957 and the first week in April turned in an even better performance . . . Unemployment, as it should, almost reversed its downward trend . . . Engineering construction awards for the week ending April 3 hit their highest total since August of 1956, 18 months ago . . . And business generally, as measured by the gross national product, is only 3% from the all-time record of prosperity. Electrical output, too, for the first week in April was 3% below the same period for 1957, although consideration has to be given to the fact that Good Friday fell in that week this year. Mr. Consumer, however, was not parting with much more of his cash for durables. Instead he was paying off his outstanding loans and, for a second month in a row, bought more federal savings bonds than he cashed in.

Western Construction Prospects Brighter

Engineering construction contracts placed in the West for March totaled $660,000,000 . . . Sylvania Electric Products Inc. has purchased a 26-acre site in the Santa Cruz area for eventual use in its expansion plans for computer component manufacturing operations . . . Reynolds Mining is continuing the purchase of coal lands in northern Wyoming to provide power for a possible further expansion in primary aluminum capacity. Present holdings under lease or purchase total 5,000 acres.

EW news roundup

HUMANS OBSOLETE?—The electronic wizards are rapidly taking over more and more of the areas which formerly required the application of human intelligence.

At the recent meeting of the Institute of Radio Engineers a data processing machine was described that reads articles, selects excerpts of the important material and prints an abstract . . . another computer translates scientific Russian into English and still a third is capable of reading ordinary typewritten addresses on envelopes and sorting them by city and state.

This is probably the forerunner of the automatic post office. It is said to be suitable for cities with populations of 100,000 or more.

—EW—

NEW EEI OFFICES—The general office of the Edison Electric Institute moved to 750 Third Ave., New York 17, N.Y., on April 25. The old famous 420 Lexington Ave. address of the institute was its home since it was organized in 1933. Since that time it has grown in size so that the staff has had to be quartered on parts of three floors of the Graybar building.

—EW—

ATOMIC FUTURE—Speaking at a recent seminar at Vallecitos, Calif., on the economic potentials of atomic power in northern California, Pacific Gas and Electric Co.'s vice-president and chief engineer, Walter Dreyer, indicated that his company will probably have one or more large nuclear power plants in service by 1965. To this he added, "It is my personal opinion that much of the new thermal capacity thereafter will be nuclear."

Alluding to the possible hydroelectric developments included in the California Water Plan, he stated, "Obviously, there can be no help from this source as a supplier of energy. The role of hydro power in the state plan should be to secure financial assistance for water development by developing and selling power to investor-owned utilities as peaking power, where it will command a high price per kilowatt-hour, and to purchase off-peak power for operation of project pumps."

—EW—

LOW LIGHT—A new fluorescent highway system that features fluorescent fixtures only 33 in. above the ground has been installed on a section of the new Jersey Turnpike by Sylvania Electric Products Inc.

The system is designed to improve driving visibility during periods of adverse weather conditions. It has been developed to reduce the amount of light that can shine into the driver's eyes and to cut the veiling fog brightness that normally interferes with vision during periods of fog.

Get Off the Worry-Go-Round

Wishful Dreamer

Perhaps you think this dreary? passive-looking guy wouldn't develop high tension. But you're wrong. It just doesn't show on the surface.

Frustration is one of HiTension's strongest allies. While his work piles up, this apathetic individual dreams about getting a more important job. He neglects his work, becomes bored with life and dreams about the big role he *should* be playing.

Our day-dreamer doesn't realize that many top executives in his own company once had jobs no more glamorous than his. He has never learned the satisfaction of doing his job as well as he can.

WASHINGTON REPORT — Insiders think that a stepped-up atomic power development program will emerge from Congress this month.

It is predicted that the program will include federal construction of three experimental-type reactors (gas cooled, dual purpose and one designed to use natural uranium); greatly increased federal research aimed at developing more efficient fuel elements; an expanded power demonstration reactor program and a program to help U. S. reactor manufacturers and equipment firms to sell reactors to foreign customers.

—EW—

The importance of the small taxpayer is pinpointed by the recent announcement that the minimum tax bracket (20%) produces 84% of all income tax revenue. By way of comparison, in late years the taxpayers in the 50% plus brackets accounted for only about 1% of the total federal revenue. Looks like the share-the-wealth program is working.

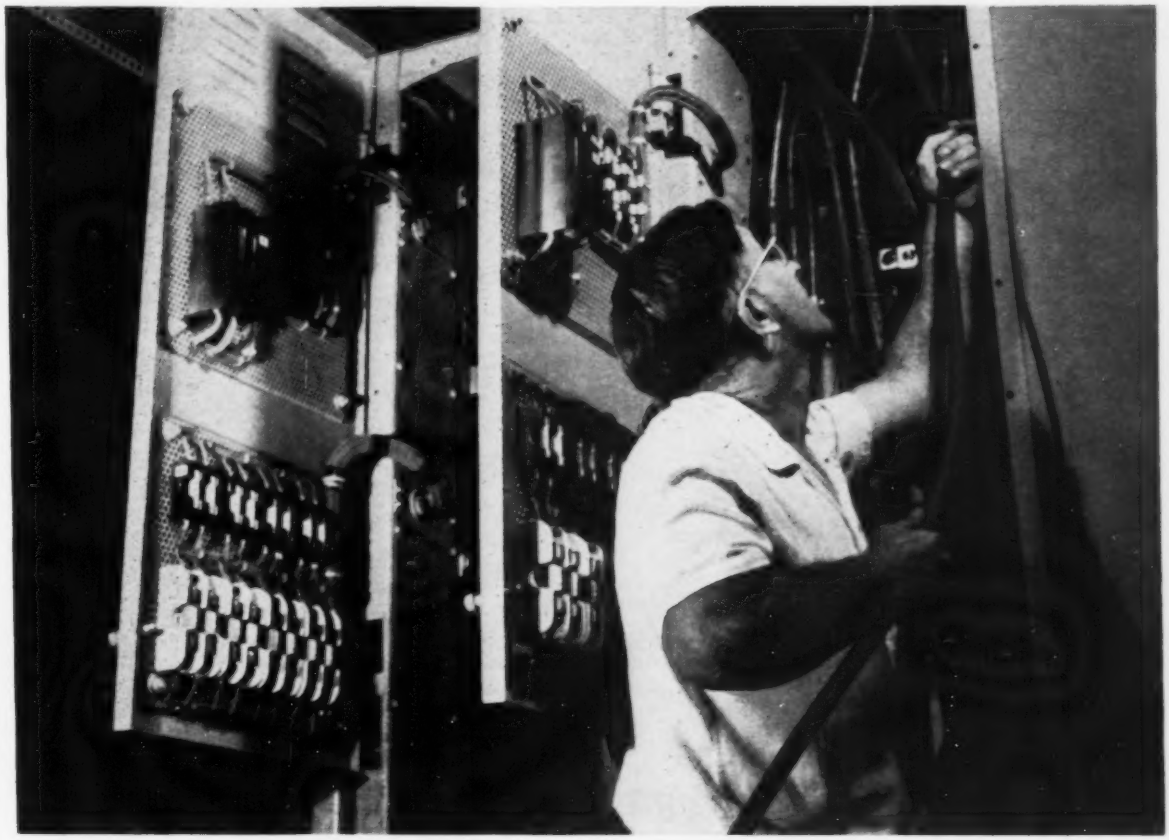
—EW—

The Martin Co. reports development of a 1,300-kw pressurized water-type reactor that can be prefabricated at the plant in seven packages and transported by air in as many C-123s. Price: $3,000,000 fob stateside, not including fuel for the core.

—EW—

TRIPLE PLAY—Argonne's experimental boiling water reactor has been operated successfully at three times its original design maximum of 20,000 tkw. This is the second time that the reactor's heat power level has been boosted successfully without hazard and without change in the number of nuclear fuel elements within the core.

Practically it means that the day of competitive atomic power appears closer as the higher thermal



When you must pack a lot into a small space . . . specify Rome's "CT-2" control cable

These cables are intended for installation in underground conduits or ducts, directly in the earth, or open air.

Conductors: Conductors conform to ASTM Specification B-8.

Insulation: Insulation conforms to IPCEA Appendix P.

Color Coding: All conductors shall be color-coded in accordance with IPCEA recommendations.

Assembly: For three conductors or more, the insulated color-coded conductor shall be twisted with jute fillers when necessary to make round, and a suitable tape shall be applied over the assembled core. Two-conductor cable shall be flat.

Over-all Sheath: An over-all sheath of Rome Synthinol* shall be applied over the tape core.

Here's a way to speed up the job of making complex control-panel connections in tight quarters. Install cable that meets your *budget*, *quality*, and *space* requirements.

You'll find that just such a cable is Rome's "CT-2" control cable. Its smaller diameter will fit into your most compact panel arrangements. It's lightweight, too, and easy to pull through conduit. And it represents good quality at moderate cost.

Your choice of cable sizes

This low-surface-friction cable has an all-thermoplastic construction featuring 3/64" Rolene insulation (polyethylene) plus an over-all sheath of Rome Synthinol (polyvinyl chloride).* It's available as a standard construction with one to 12 conductors in No. 9 and No. 12 AWG sizes.

Insulation: Sure and dependable terminations are possible because Rolene strips cleanly. This smooth, positive-stripping polyethylene lets you consistently make an efficient installation.

Sheath: Rome Synthinol is a thermoplastic (PVC) compound that offers high resistance to oils, most acids, alkalis, grease, gasoline, weathering and flame.

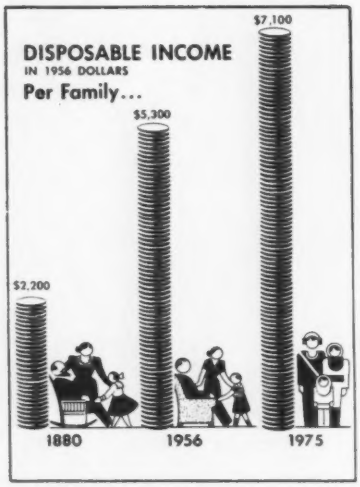
Use Rome's "CT-2" control cable for your next job where space is at a premium and fast, efficient installation is mandatory.

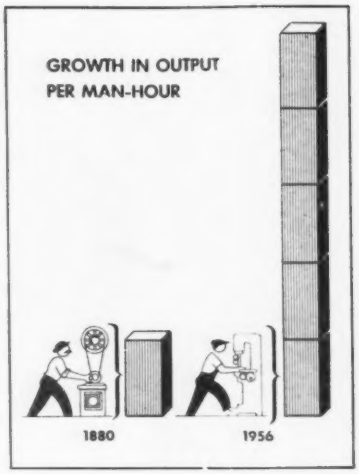
Find out how Rome's control cable can fit your installation picture. Contact your nearest Rome Cable representative—or write to Department 852, Rome Cable Corporation, Rome, N. Y.

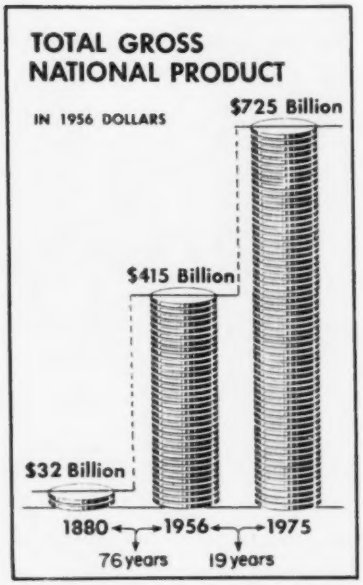
*Alternate sheaths of Rolene (polyethylene) or Roseal (flame-resistant polyethylene) are also available.

ROME CABLE

CORPORATION







Here's what will happen by 1975, according to a report recently released by Committee for Economic Development, if the nation continues to manage its affairs with intelligence and maintains 3% per year increase in gross national product. Ingredients for progress, according to the report, are improvement of public education, continuous investment in new enterprises, increased private savings, efficient management of government and business and a rising foreign trade. Average income, after taxes, $7,100

output would reduce the cost of capital investment—a substantial increment of the over-all cost of atomic power at present.

TVA's Merill Demerit and K. E. Hapgood predicted that, barring inflation, TVA's investment per kilowatt in transmission facilities would be reduced from $42.50 to about $35. They indicated that TVA's initial investment per kw was $80, having been reduced to today's $42.50. Over the same period, the system's average kilowatt-hour losses were reduced from 8¼% to 3½%.

—EW—

ULTRASENSITIVITY — Refinements in the progress of instrumentation were dramatically illustrated last month with the announcement of a new instrument so sensitive it can detect one-thousandth of a gram of chromium-51 dissolved in the Columbia River.

It is the outgrowth of work by R. W. Perkins, a G-E chemist at the Hanford Works of the Atomic Energy Commission, and is capable of measuring lower radioisotope concentrations than those occurring naturally in common foods such as meat, milk and vegetables.

—EW—

SAFETY SPUR — The National Safety Council has two new publications available for industry, one for employees and the other for foremen. The first, "Rules for Safety," is reported to be the biggest and best safety rules booklet ever com-

Test yourself to see if you know

When to Delegate

	True	False
1. The harried executive is likely serving inner urges—not his employer.	.....	.....
2. When an organization loses good men to competition (or other departments), there are indications that management has not delegated properly.	.....	.....
3. A successful manager age 50 should be able to point to many former employees in top jobs.	.....	.....
4. You are more likely to receive the favorable attention of your superiors with a clean desk than one stacked up with work.	.....	.....
5 I should keep for myself the work I can do best and delegate the rest.	.....	.....
6. Without some free time, I can't learn to do my boss's job.	.....	.....
7. Important special studies usually find their way into the hands of the man who can delegate.	.....	.....
8. A good manager is not afraid to make himself expendable.	.....	.....
9. If I delegate to a high degree, I lose control of the facts necessary to make key decisions.	.....	.....

(*Answers on p* 97)

How to keep exposed cable from catching a "chemical cold"

When exposed cable in a chemical plant "catches cold," it's usually fatal. Reason: drizzling drops and sprays of corrosive chemicals—or even fumes and moisture—attack most conventional cable interiors . . . sometimes in a matter of months. This leaves the conductor unprotected—and leaves the plant open to power failure. The only remedy, then, is costly replacement.

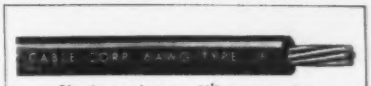
You can keep *your* exposed cable systems safe from "chemical colds" by installing Rome's versatile, low-cost FlexAll Type UF (nonmetallic sheathed cable). It gives positive protection against corrosive damage.

The reason is Rome Synthinol—the all-thermoplastic construction that gives FlexAll an umbrella of protection against drizzling acids or alkalis . . . as well as the effects of rot, flame, abrasion and moisture.

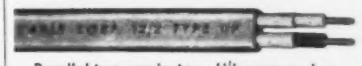
Rome's FlexAll is especially recommended for interior wiring of chemical plants. It is also widely used for underground between-building wiring; farm, industrial and residential yard lighting; livestock buildings and packing houses; and for breweries, cold storage and ice plants.

Rome's FlexAll is available in single, two or three conductor construction. These multi-purpose constructions meet NEC requirements for direct-in-earth burial as well as interior wiring—*in dry or wet locations.*

Specify Rome's FlexAll in your next job. Contact your nearest Rome Cable distributor for more information—or write to Department 347, Rome Cable Corporation, Rome, New York.



Single conductor—U/L approved as Type UF (Underground Feeder)

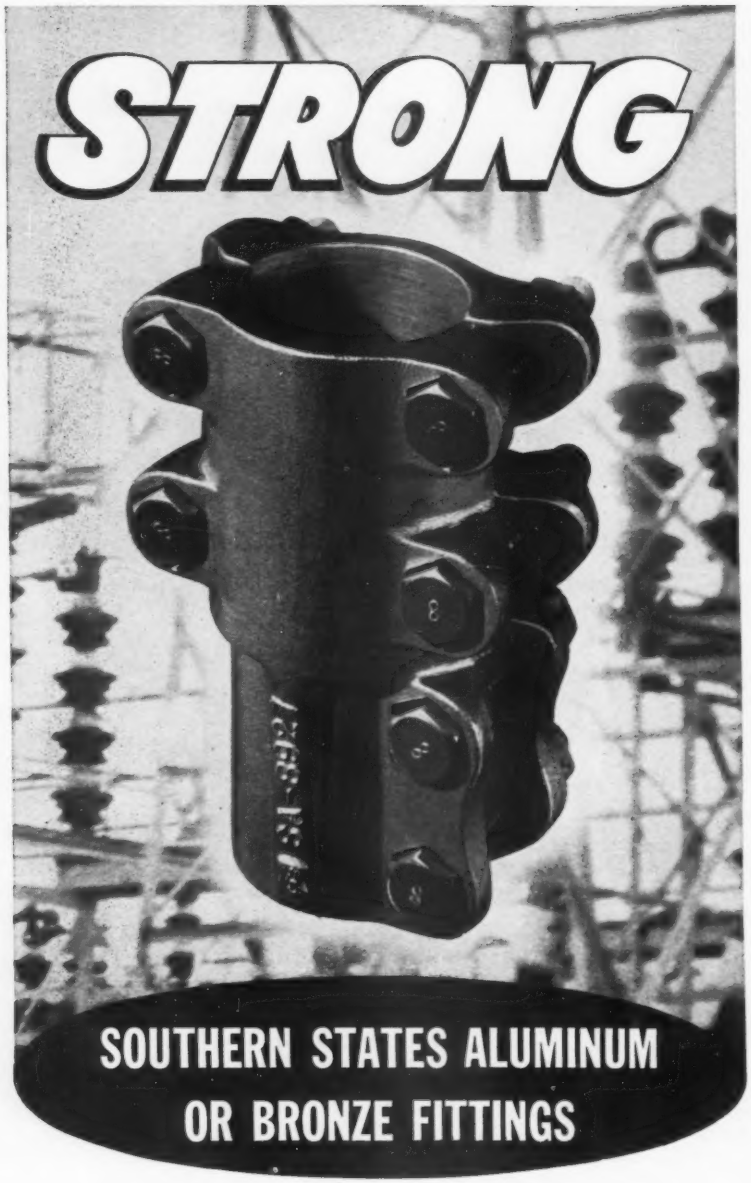


Parallel two-conductor—U/L approved as Type UF and Type NMC (Nonmetallic sheathed—corrosion resistant)

Parallel three-conductor—U/L approved as both Type UF and Type NMC

ROME CABLE

CORPORATION



Frequent use of connectors as supporting members requires that they be physically strong as well as electrically sound. To achieve this, and yet avoid excessive bulkiness and weight, Southern States uses proven alloys—developed over a period of more than 25 years. All of the fittings in the ever-expanding line of Southern States connectors are designed to assure you of maximum strength. *Never underestimate the importance of a good connection!*

SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto

piled and consists of 40 pages covering accident prevention dos and don'ts, hows and whys. It covers such areas as the use of power tools, stacking material, lifting and carrying.

Book No. 8 in a series of "Five Minute Safety Talks for Foremen" is designed to promote safety in industry and covers subjects such as "Why We Have a Safety Program." Descriptive brochures on the new publications can be obtained from the council offices at 425 N. Michigan Ave., Chicago 11.

—EW—

Upping the ante, the National Society of Professional Engineers has recently urged a per-diem rate of $100 for temporary consultants engaged by the federal government. The society based its recommendation on the fact that the federal government deserves and is entitled to the very best engineering talent obtainable, and that a $75-a-day maximum might cause top-quality consultants to decline government work.

—EW—

HOT MOUNTAIN – The Atomic Energy Commission has reported experiments in the underground detonation of atomic blasts.

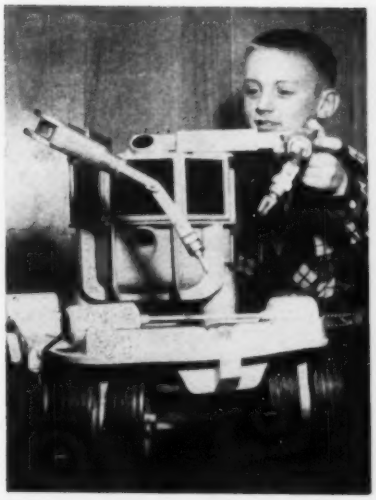
AEC's project Plowshare exploded a nuclear bomb within the rock caves of a mountain. As the conductivity of dry rock is practically zero, it might be possible to pump water down into the heat chamber thus produced and create steam which could be converted into usable electrical energy.

There is a strategic implication too. It would be difficult to police any A-bomb control scheme if experimental blasts can be touched off underground without detection.

—EW—

Walter Lucking, the energetic president of Arizona Public Service Co., has spark plugged the formation of a "Plan for Progress" committee to undertake a two-year study that will chart the future for Phoenix. His plan drew the enthusiastic support of 200 business and civic leaders and promise of a half a million dollars to finance the survey.

The study will determine planning for the region's schools, roads and location of residential and industrial areas. It will include all of the area within a 50-mile radius of



This is the "beetle" in model form. It is a manned, self-propelled vehicle equipped with manipulator arms to service power plants of the type that will drive nuclear-powered aircraft and will be used at the AEC national reactor testing station near Idaho Falls, Idaho. Mechanical manipulators will have a 16-ft reach and are attached to a cab that can be elevated 15 ft or rotated in a complete circle. The operator will be shielded by 75,000 lb of lead and steel and 22-in.-thick windows

Phoenix, the population of which is expected to reach a half a million people in the near future.

—EW—

NEMA added its voice to those protesting the Internal Revenue Service's proposed ruling to make cooperative advertising funds subject to excise tax. It wired association protest to Commissioner Harrington, then asked each of the 13 members of its Excise Tax Committee, representing major electrical manufacturers, to send their personal views before the April 21 deadline for confirmation of the proposal.

—EW—

The Los Angeles Department of Water & Power has placed in service the city's first underground distributing station. Cost of the 156x100 ft structure was $1,300,000. For details of this unusual station, see ELECTRICAL WEST, September 1957, p 122.

—EW—

Reliance Electric & Engineering Co. has moved its operations to 2557 Yates Ave. in Los Angeles, where it

Subox Has a Paint For Every Need

If it's a steel tower, for power transmission or any other purpose, there are Subox paints for every protective and decorative requirement.

SUBOX are the only paints in the United States made with *suboxide of lead*. After drying, Subox continues to be chemically active to form a strong, impervious film. A single coat of Subox usually lasts five to eight years even under severe weather conditions.

SUBOX "600" SERIES contains an epoxy resin for increased chemical, alkali and water resistance. Gives added protection against corrosive fumes and extremes in temperature changes.

GALVANOX, with a high content of special metallic zinc, provides an electro-chemical type of protection. Not to be confused with ordinary zinc oxide paints, it is superior for reconditioning damaged galvanized surfaces.

AEROX is the name used to distinguish the orange and white Subox-made paint used for towers near airfields. It holds its brilliant visibility well under all conditions.

Write today for descriptive literature and color card.

SUBOX PAINTS

Subox Inc.
Trade Mark

Established 1924
18 Fairmount Plant
Hackensack, N. J.

has 15,000 sq ft of office and warehouse space. Howard Latta is branch manager.

—EW—

Banner Hardware Co. of Denver has been cited by General Electric Co. for selling more G-E radios in 1957 than any other dealer in the Rocky Mountain region. Jack Calahan, district representative for G-E's radio receiver department, presented radios to the firm's four partners—Max and Ed Lackner, Norman and Harry Levy.

—EW—

EEI has published a new directory for use by utilities and their allies in locating sales training materials. Fourteen sections list films, slide sets, scripts, recordings, kits, manuals, etc., with prices and sources. Copies are available at $2.50 each from Commercial Department, Edison Electric Institute, 750 Third Ave., New York 17.

—EW—

HOLDOUT—For the first time since it was opened in 1888, the historic Hotel del Coronado at Coronado, Calif. (scene of the forthcoming PCEA convention May 14-16), will get central station electric service. On March 20 the San Diego Gas & Electric Co. connected service to the historic structure, which has facilities comparable to those of a city of 1,500 people.

—EW—

Two General Electric engineers predict that boiling-water reactors will offer the cheapest source of atomic electric power in 1964. At that time, boiling-water reactors will produce power for about 8.5 mills per kwh, whereas sodium-cooled reactors will be at 9.7 mills and gas-cooled reactors at 12.4 mills.

—EW—

NEW PRODUCT—Aluminum Company of America has perfected a process for producing tubular shapes within sheet and plate. You will be seeing it in its final form in refrigeration, air conditioning and residential heating equipment in the near future.

The product is a one-piece unit of aluminum sheet or plate containing a series of lengthwise parallel areas that can be pumped up either

THE WESTERN BRAND OF QUALITY

For These Electrical Products

Circle A-W Products Company and Alwalt Manufacturing Co. extend a hearty welcome to all NAED members and their friends attending the National "Golden Anniversary" Convention in San Francisco.

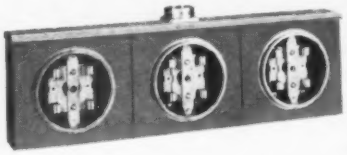
(Sold **ONLY** by Electrical Wholesalers)

- ★ Wiring Gutter and Fittings
- ★ Hinge Cover Wireway and Fittings
- ★ Transformer Cabinets
- ★ Screw Cover Boxes
- ★ Hinge Cover Boxes
- ★ Cabinet Boxes
- ★ Weatherproof Boxes
- ★ Meter Troughs
- ★ Utility Boxes

All these products are manufactured by Alwalt Manufacturing Company.

Above: Flush or Surface Cabinets; made in 10, 12, 14, and 16 Gauge.

Above: Screw Cover—Rain Tight Gutter; sealing device available on all sizes.



Right: 3-Gang Outdoor Meter Trough; made for outdoor installations (rain tight).

Circle A-W brand products are known throughout the West for quality; and Circle A-W Products Company enjoys a reputation for speed and efficiency of service.

In addition to our rapidly-expanding line of off-the-shelf products, we welcome an opportunity to work with you on any special problems.

Write, today for our free full-line catalog.

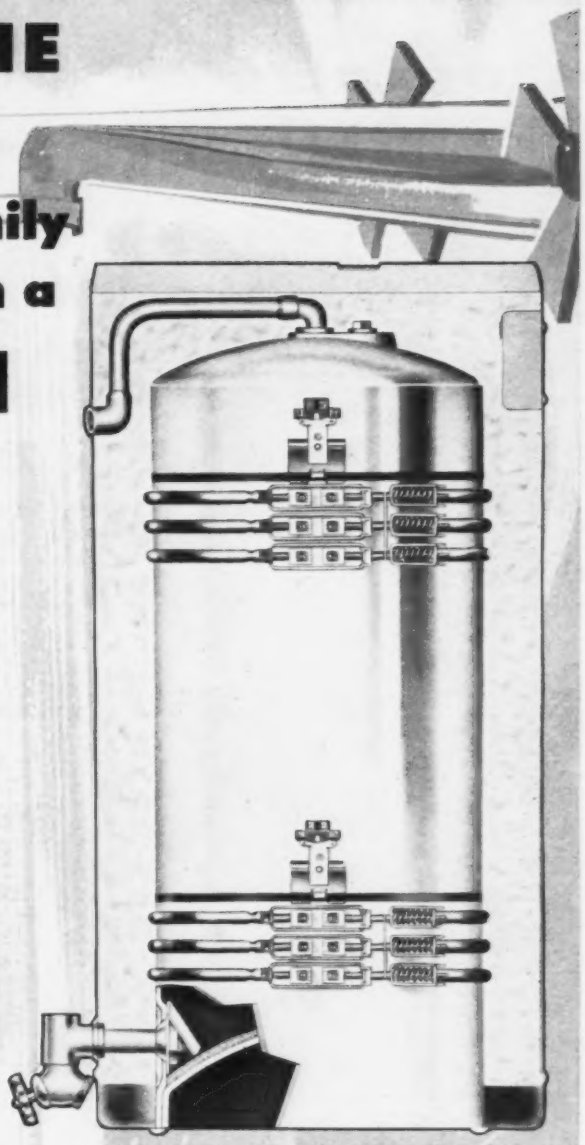
CIRCLE A-W PRODUCTS COMPANY

P. O. Box 1171 • Modesto, Calif.

NOW—ALL THE HOT WATER

that any normal family will ever want—from a

40-GALLON TANK!



New Hotpoint SUPER-SPEED Water Heaters are *RIGHT* for 95% of your customers.

Here's tremendous hot water production in a bare minimum of space. Calrod® Magic Circle heat delivers 470 gallons of hot water every 24 hours... and it will raise 18 gallons 100° in just one hour. Even from a cold start, it will heat water for 3 shower baths in 25 minutes.

Hotpoint Quick-Recovery Water Heaters save space and simplify installation. And the new miracle MLC-7 additive in Perma-Seal models can increase the life of the tank by 200%!

SUPER-SPEED Water Heaters will help you put more POWER in "House-Power"—more LIVING in "Live Better . . . Electrically!"

Hotpoint

LOOK FOR THAT DIFFERENCE! (your customers do!)

HOTPOINT CO. (A Division of General Electric Company), CHICAGO 44, ILLINOIS

ELECTRIC RANGES · REFRIGERATORS · AUTOMATIC WASHERS · CLOTHES DRYERS · COMBINATION WASHER-DRYERS
CUSTOMLINE · DISHWASHERS · DISPOSALLS® · WATER HEATERS · FOOD FREEZERS · AIR CONDITIONERS · TELEVISION

faster, lightweight, versatile

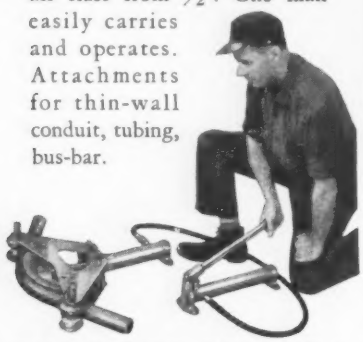
HYDRAULIC CONDUIT BENDERS

Bend ½" to 4" conduit . . . 90° in one stroke . . . with the powerful new GREENLEE No. 884 Power Bender, above.

Many advanced features: Portable . . . one set of pipe supports for all 10 sizes . . . easy pipe removal . . . easy-to-read scale . . . identical bends easily reproduced.

90° bend in 4" conduit takes 4 minutes with GREENLEE Portable Power Pump shown . . . only 30 seconds with larger GREENLEE pumps!

Bend ½" to 2" conduit . . . 90° in one ram stroke . . . with GREENLEE No. 880 Hydraulic Bender, below, hand-pump or power-pump operated. Handles all sizes from ½". One man easily carries and operates. Attachments for thin-wall conduit, tubing, bus-bar.



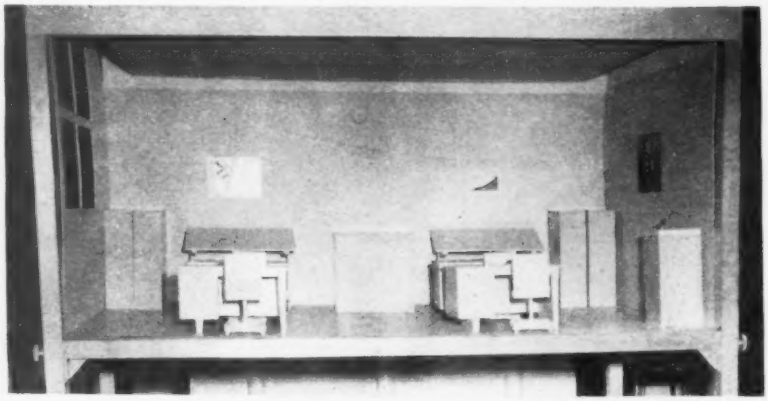
GREENLEE TOOL CO.
1765 Columbia Avenue, Rockford, Illinois

This is the Plan Room, a new service recently opened at 1417 Georgia St. in Los Angeles. The official open house was on April 15. President of the Plan Room is Charles H. Hayes, and operator of the building, which carries the name Plan Room Building, is Fred J. Tabery. Function of the room is to have on hand a library of the majority of plans on jobs being bid in the southern California area, so that suppliers and subcontractors have them available for making takeoffs or other information preparatory to bidding. Other floors of the building have been converted into modern air-conditioned furnished offices for manufacturers' representatives and others who will use the Plan Room

hydraulically or with air to form tubular shapes. Free inflation results in round tubing, restraining by dies produces a variety of shapes.

—EW—

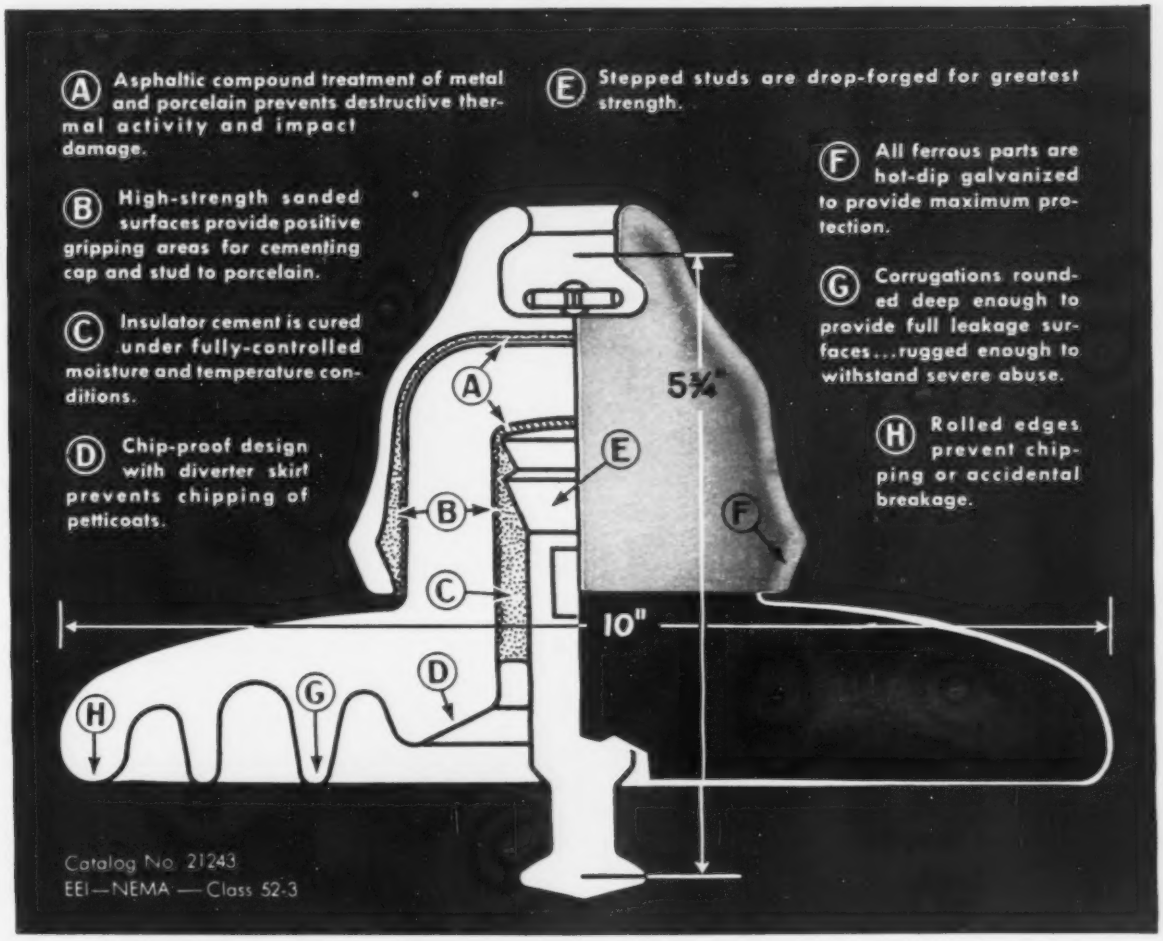
Copperweld Steel Co. in conjunction with the Battelle Memorial Institute has succeeded in creating an aluminum-covered steel rod (similar to Copperweld) which can be drawn into wire. The new product known as Alumoweld is now being produced in a pilot plant, which is presently being converted to an experimental line for limited production.



PORTLAND GENERAL ELECTRIC has adapted for office lighting the demonstrator it used so successfully for school lighting. Designed for service club presentations, the scale model office shows different types of illumination and decoration to meet varying office conditions. It has sets of dark and light furniture and different wall color schemes to demonstrate reflectances. Four lighting systems are built into removable ceilings: bare tube and luminous indirect fluorescent, luminous indirect incandescent and total luminous fluorescent. It is 72 in. long, 36 in. high and 42 in. deep, stands on 3-ft legs. Headed by Chester Jarrett, PGE lighting specialists will tour the system with the model

Custom-Built Thomas Insulators meet severest requirements

CHECK THESE FEATURES


(A) Asphaltic compound treatment of metal and porcelain prevents destructive thermal activity and impact damage.
(B) High-strength sanded surfaces provide positive gripping areas for cementing cap and stud to porcelain.
(C) Insulator cement is cured under fully-controlled moisture and temperature conditions.
(D) Chip-proof design with diverter skirt prevents chipping of petticoats.
(E) Stepped studs are drop-forged for greatest strength.
(F) All ferrous parts are hot-dip galvanized to provide maximum protection.
(G) Corrugations rounded deep enough to provide full leakage surfaces...rugged enough to withstand severe abuse.
(H) Rolled edges prevent chipping or accidental breakage.
5¾"
10"
Catalog No. 21243
EEI—NEMA — Class 52-3

Wherever service conditions make the severest demands on insulators, a Thomas Insulator always gives complete assurance of satisfactory performance. That is particularly true of the insulator illustrated. It is designed and custom-built for installations where physical ruggedness is as important as insulating effectiveness. It fully meets all standard requirements for insulators of its type and capacity. It embodies all the tested refinements of construction and design which assure longer service life and superior performance. For free data sheet, write *Thomas Works, Delta-Star Electric Division, H. K. Porter Company, Inc., Lisbon, Ohio. District offices in principal cities.*

H. K. PORTER COMPANY, INC.

DELTA-STAR ELECTRIC DIVISION

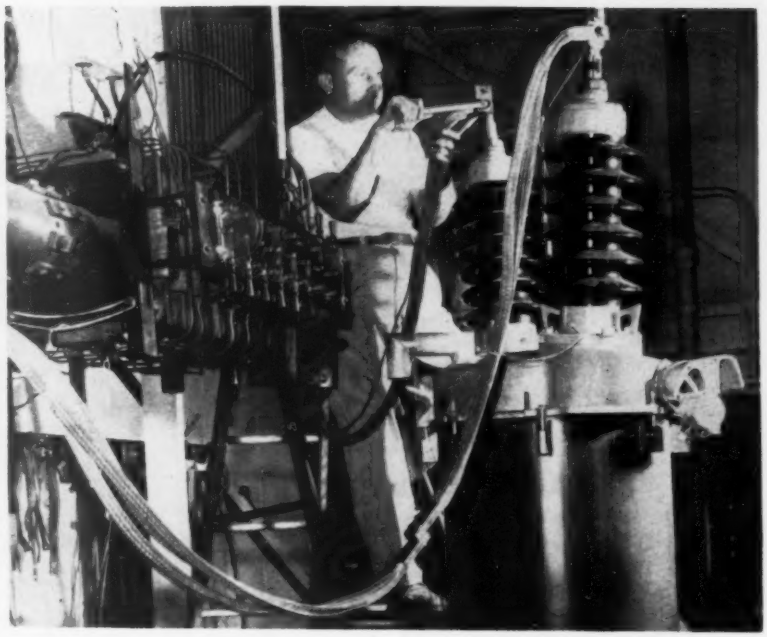
Connors Steel, Delta-Star Electric, Disston, Forge & Fittings, Leschen Wire Rope, Quaker Rubber, Refractories, Riverside-Alloy Metal, Vulcan-Kidd Steel, H. K. Porter Company (Canada) Ltd.

PRODUCT NEWS

New Designs and Applications

Circuit Reclosers

(1) *R&IE Equipment Division, I-T-E Circuit Breaker Co., Greensburg, Pa.*

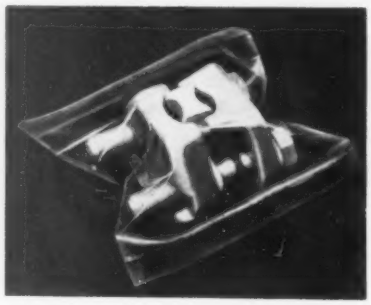


Fast reclosing protection for subtransmission and higher voltage distribution lines is provided by new 34.5- and 46-kv automatic circuit reclosers offered by this company. The reclosers have 1½-cycle clearing of 250-mva faults and a 400-amp continuous-current carrying capacity. Tests on a prototype model encompassed a total of more than 130 individual circuit interruptions and a range of current and voltage from minimum operating levels to greater than assigned ratings of 3,000 amp, rms symmetrical, for 46 kv and 4,000 amp, rms symmetrical, for 34.5 kv. The manufacturer reports that tests also disclosed that the units have (1) low rate of insulating oil deterioration, (2) long contact life, (3) high mechanical and electrical durability. Operating speed is related to magnitude of fault current because the recloser is a solenoid-tripped device, but circuit interruption takes place in four cycles even at minimum operating current, with clearing as fast as 1½ cycles at maximum rated fault current, the manufacturer reports. Circuit interruption is accomplished with a single-contact, oil-column interrupter. The recloser's two-cycle instantaneous tripping is followed by 25-cycle reclosing with one, two or three inverse-time operations. Continuous-current ratings available are 140, 200, 280, and 400 amp.

Hydraulic Operator

(2) *Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.*

This company has extended the use of its hydraulic closing mechanism to 600- and 225-amp electrically operated, low-voltage air circuit breakers. The hydraulic operator, which permits closing directly from a-c power source with low control power requirements, has been available on 1,600-amp low-voltage breakers since 1955. The smooth and quiet fast-closing action of the breaker is said to reduce stress on operator and contact components. Selective and thermal trip devices for the 225-, 600- and 1,600-amp breakers are all interchangeable.



Connectors

(3) *Anderson Electric Corp., Box 2151, Birmingham 1, Ala.*

This company announces the availability of a new connector that is designed to be a one-piece assembly that can be worked hot without the nuisance of dropping parts. Also announced is a new inhibitation process that is to be applied to all distribution connectors, which consists of filling contact grooves with a special inhibitor and enclosing the connector assembly in polyethylene. On the two-bolt connector, one bolt is peened and the other is equipped with a rubber grommet so it can be threaded out from the upper casting to allow 180° turning of the lower casting and spacer. In the OPEN position, the connector can be placed against an energized wire with a hot line flexible wrench stick and manipulated into the connecting position.

Summer-Winter Thermostat

(4) *Barber-Colman Co., Rockford, Ill.*

A new summer-winter change-over thermostat is being offered by this company. It is designed for use on combination heating and cooling air conditioning units. The manufacturer reports that the thermostat effectively senses the temperature of the supply media and will reverse the control action of the room thermostat sensing element to comply with the flow of either hot or chilled water. It also has applications in process control. The thermostat has a non-adjustable control point setting at 70° and a fixed differential of approximately 15°.

Thermalastic insulation sets reliability record

ANOTHER PRODUCT OF EARNINGS PLOWED BACK

Faced with sharply rising operating costs, electric utilities know they can't rest on a plateau of efficiency. To continue bettering their performance, they demand more capacity, more reliability in new generating equipment . . . advances that come only through intensive research efforts.

By plowing back earnings into a program of pure and applied research, Westinghouse has developed many such advances, as typified by Thermalastic® insulation. The record: *Since 1949, Thermalastic insulation has assured the trouble-free operation of more than one-half million coils in electrical apparatus such as generators and large motors.*

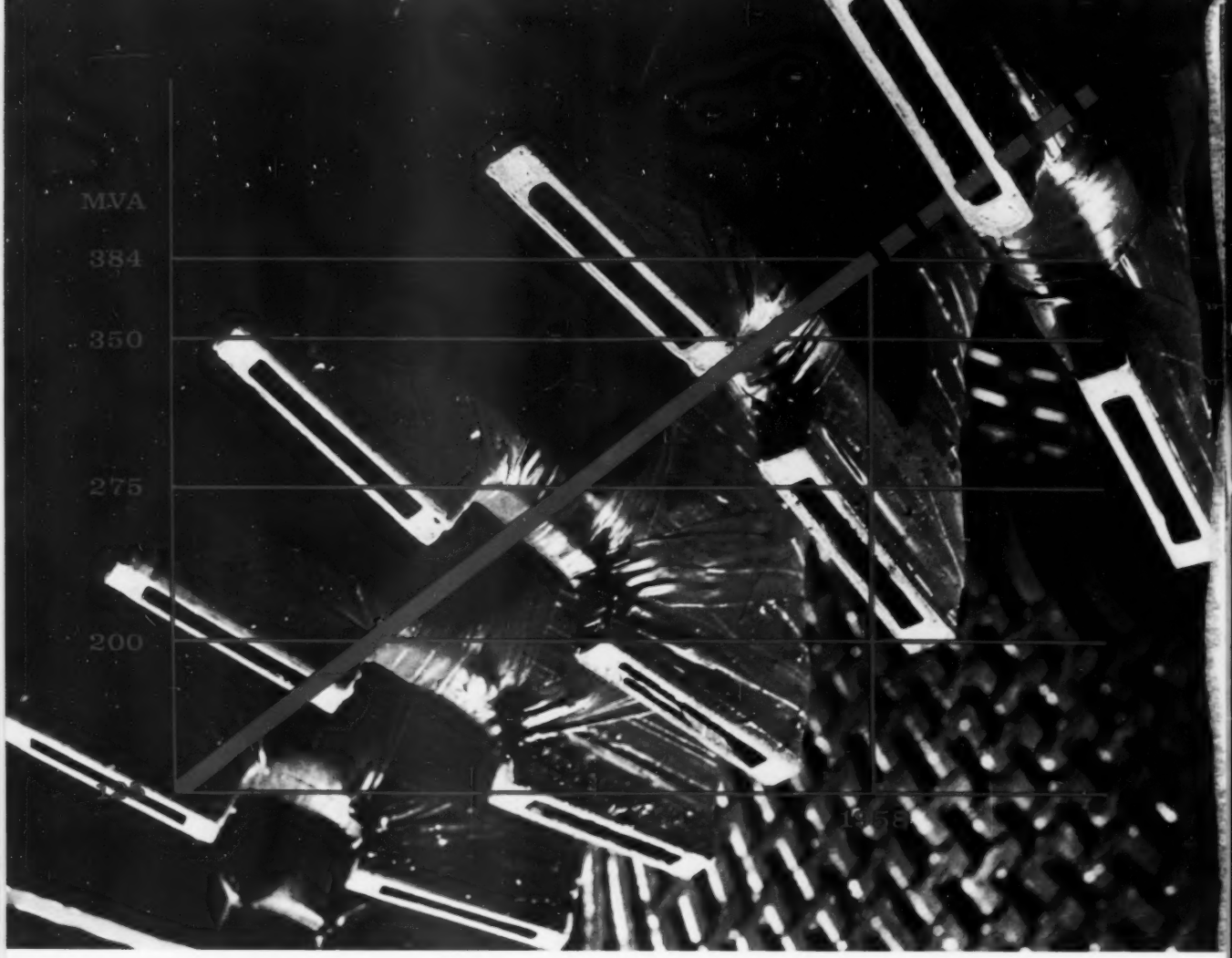
More than 6,000 scientists, engineers and technicians in Westinghouse research and development laboratories are at work developing and perfecting new techniques, materials and products such as Thermalastic insulation. This reinvestment in research is helping utilities produce more electricity at less cost.

For a new booklet describing the Thermalastic insulation system, write to Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania.

Voltage tests prove that Thermalastic insulation has a 1000-to-1 advantage. Operating voltages can't get through the fish-scale barrier of large mica splittings . . . locked in a memory-type elastic bond.

YOU CAN BE **SURE**... IF IT'S

Westinghouse



THROUGH PLOWBACK OF EARNINGS INTO RESEARCH . . .

Westinghouse hydrogen inner-cooled generators set world's capacity record

A 384,000-kva hydrogen inner-cooled generator, now under construction at Westinghouse, will soon break the world's capacity record. The largest capacity generators *operating* today are two 319,445-kva rated units, also Westinghouse hydrogen inner-cooled.

Westinghouse succeeded in developing and introducing hydrogen inner-cooling of both stator and rotor windings of large turbine generators after plowing back millions of dollars into research and engineering.

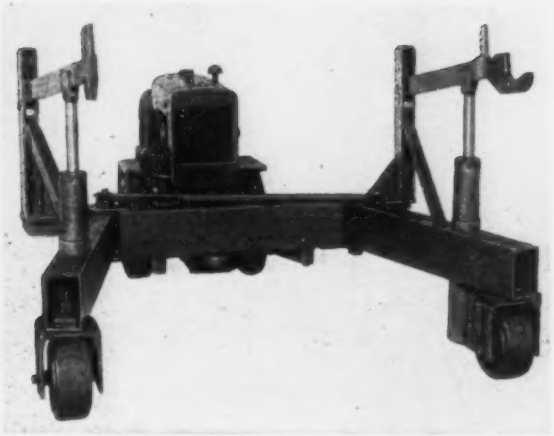
This method of cooling generators has made possible the large ratings that are common . . . and necessary . . . today.

When even larger ratings are needed, Westinghouse will provide them with the same hydrogen inner-cooled system, proved reliable by more than 3,200,000 kva already in service.

Hydrogen inner-cooling is a typical result of Westinghouse research . . . research that provides electric utilities with *advanced* generating equipment. Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.

JI-97229-2

YOU CAN BE SURE...IF IT'S Westinghouse



Reel Handler

(5) *Erickson Power Lift Trucks Inc.,* 263 *St. Anthony Blvd., N. E., Minneapolis* 18, *Minn.*

One man can handle large reels of cable with the use of this new machine. It is capable of handling reels up to 96-in. diameter, and has hydraulically controlled load arms that adjust to the width of the reel. Reel is picked up by a bar shoved through the middle that acts as an axle. Three models available are in capacities of 10,000, 14,000, and 20,000 lb.

Air Circuit Breaker

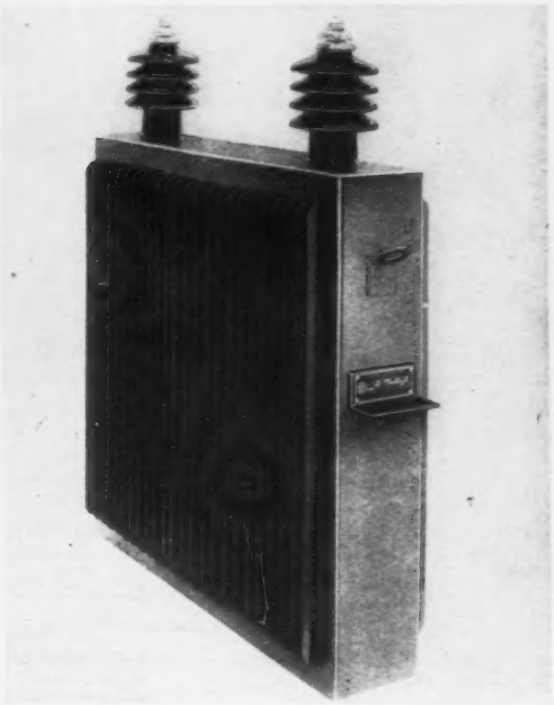
(6) *Westinghouse Electric Corp., Box* 2099, *Pittsburgh* 30, *Pa.*

A new metal-clad switchgear unit with a 13.8-kv magnetic air circuit breaker of 1,000-mva interrupting capacity is now available from this company. The breaker was designed for use in protecting distribution circuits in large substations in metropolitan areas. Though it has 35% greater interrupting capacity than the next lower rating of its type, it has the same height and width and is only 4 in. deeper. A horizontal drawout feature simplifies replacement or maintenance.

Temporary Service Equipment

(7) *Blakeman Bros. Electric Mfg. Co. Inc.,* 5859 *Compton Ave., Los Angeles* 1, *Calif.*

This new product is designed for use by the electrical contractor for temporary service during building construction. It is a self-contained, raintight unit. Grounded receptacles for 110-v, three-wire and 220-v, four-wire tools. Each receptacle is separately protected by breaker for overload. A 100-amp meter socket and raintight hub are provided. Dimensions are 18 in. high, 8 in. wide and 4½ in. deep. The device meets all California State requirements and all power company requirements, and is UL listed, according to the manufacturer.



100-Kvar Capacitors

(8) *Cornell-Dubilier Electric Corp., South Plainfield, N. J.*

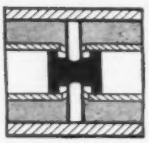
The first individual capacitor units rated to deliver a full 100 kvar are now being produced by this company. It will be available in standard voltage ratings of 4,800, 6,640, 7,200, 7,620 and 7,960 v. Each unit produced will be full voltage energization tested as a quality control measure, the company reports. Nearly two years of planning and development testing are behind the announcement. A unit contains nearly ½ mile of aluminum foil and about 2½ miles of kraft paper. Advantages cited by the manufacturer are: lower installation costs per kvar, savings in space in substation racks and more compact pole-mounted banks.

Lighten Your Load...
Increase Your Load Capacity...

with Prodelin's New
ALUMINUM
COAXIAL TRANSMISSION LINES and COMPONENTS

Here is a new high in rigid coaxial transmission line efficiency and performance! Now Prodelin has applied its field-proved, reactance-compensated teflon pin insulator support within aluminum outer conductors.

This service-tested construction technique provides constant broadband impedance characteristics consistent with high power handling capability and low VSWR . . . and aluminum offers strength, corrosion-resistance, lightweight, and handling ease.


Diagramatic of reactance compensated insulator

VHF SERIES "700" teflon pin supported inner conductor
UHF SERIES "900" service tested reactance compensated inner conductor support

Both series lines are available in the 7/8", 1 5/8", 3 1/8", 6 1/8" and 10" sizes, 50 and 75 ohm impedances. EIA (RETMA) flanges are available.

FOR MILITARY AND COMMERCIAL SERVICES

FEATURES

- Highest Power Handling
- Low VSWR
- Performs up to 250°C
- Constant 50 or 75 ohm Impedance
- Corrosion Resistant
- High Tensile Strength
- Lightweight, Easy to Handle
- Little Maintenance Required

WHEN COPPER IS PROPER

Prodelin still stocks rigid coaxial transmission lines with copper outer conductor.

VHF SERIES "600"
teflon pin supported inner conductor
UHF SERIES "800"
service tested reactance compensated inner conductor support
50 ohm only
7/8" 1 5/8" 3 1/8" 6 1/8"
all EIA (RETMA) standardized

WRITE TODAY
FOR TECHNICAL BULLETIN

ANTENNAS and TRANSMISSION LINES
Prodelin Inc
KEARNY, NEW JERSEY, U.S.A.

Dept. EW-5
307 Bergen Ave., Kearny, N. J.

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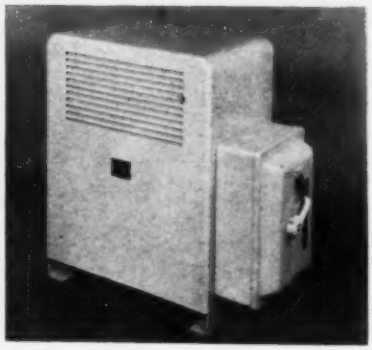

Transformer-Breaker

(9) *Westinghouse Electric Corp., Box 2099, Pittsburgh 30, Pa.*

Dry-type distribution transformers with wall-mounted breakers are now available from this company, for 300-kva ratings and below. In the new arrangement, the breaker is mounted on the side of the transformer and is connected internally to the high-voltage winding, making an integral package. Savings in space and installation costs result, and conduit run and conduit fittings associated with remote mounting of the breakers are eliminated.

Panel Enclosures

(10) *Hoffmann Engineering Corp., Anoka, Minn.*

NEMA type 1 panel enclosures to house electrical and electronic controls have been added to this company's line of electrical boxes. They are designed for installations that do not require oil- and dust-tight characteristics. The 13 standard sizes are available.

Aluminum Cable Trough

(11) *T. J. Cope Division, Rome Cable Corp., Collegeville, Pa.*

This company now offers cable trough in expanded aluminum to supplement the expanded galvanized steel cable supports presently offered. The new cable supporting system includes a wide range of standard fittings to provide simplicity, flexibility and low cost in installation, the manufacturer reports. Manufactured with solid sides for greater strength. Sections are secured by flat pins driven between interlocking barrels. Straight lengths available in widths of 6, 9, 12, 18 and 24 in. and in 8-, 10- and 12-ft lengths.

Proven rugged by long service in utility systems throughout the world! Cast from high strength, non-corrosive aluminum alloy. Light weight reduces conductor damage . . . flared mouth design prevents chafing. Engineered for minimum hysteresis and eddy current losses. Clevis pin locked against rotation. Speed cotter key facilitates maintenance while energized.

ANDERSON ELECTRIC CORPORATION • BIRMINGHAM 1, ALABAMA
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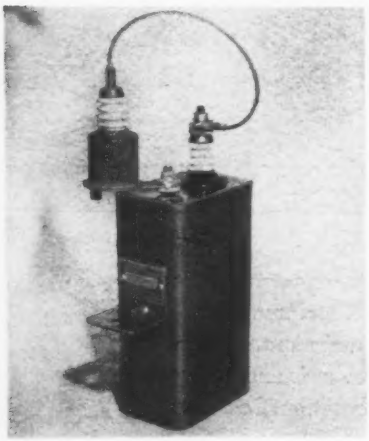
Aluminum and Bronze Power Connectors • Clamps • Fittings • Accessories for SUBSTATION • TRANSMISSION • DISTRIBUTION

Pole Puller

(12) *Joyce-Cridland Co., 2027 E. First St., Dayton 3, Ohio.*

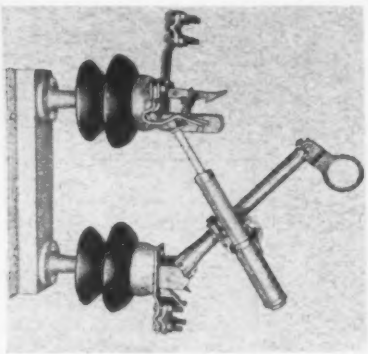
This company has designed an air motor jack of 20-ton capacity to be used pulling utility poles. Recent tests were on 90-ft, class 2 poles. With the pole supported by a truck-mounted "A" frame, a chain was stretched over a specially designed lift on the jack's cap and attached to the pole base. Operating pressure of 90 psi is required to operate the jack, and was supplied by the utility company's compressor truck.



Series Capacitor

(13) *General Electric Co., Capacitor Department, Schenectady 5, N. Y.*

New series capacitor equipment consisting of protective gap and capacitor is now available from this company. It is for use with 2400-, 4,800-, and 7,200- to 7,960-v distribution transformers 10 kva to 37.5 kva. It is rated 2, 3, 5, and 7½ kilovars, 240, 480 and 720 v. The gap, which prevents excessive voltages from occurring on the capacitor and transformer, automatically by-passes the capacitor once each half cycle when abnormal voltage conditions exist across the capacitor. The gap then reinserts the capacitor when normal voltage is restored.



Load Interrupter

(14) *Line Material Industries, Milwaukee 1, Wis.*

A new expulsion-type load interrupter is available for mounting on this company's hook-stick operated or horizontal-break switches. The interrupters are rated 600 amp at 15 kv and are applicable to 7.5- or 15-kv systems. Switches equipped with the new units interrupt magnetizing currents and load currents with arcing times of 1½ cycles or less. Arc-extinguishing gases work when the arc is drawn out in a confined space between a fiber contact-follower and an acrylic tube. Gas pressure is relieved through vent holes following the interruption.

Romex Connector

(15) *Buchanan Electrical Products Corp., Hillside, N. J.*

A new Romex connector offered by this company is designed for fast and easy installation on nonmetallic sheathed cables, portable cords, etc. Made in one piece of a special heavy-duty aluminum alloy with no screws or lock nut. The connector fits standard ½ in. knockouts. Installation is by inserting cable in junction box knockout. Slide connector over cable and squeeze with channel-lock-type pliers or side cutters. This locks connector to cable and to the box.

NEW
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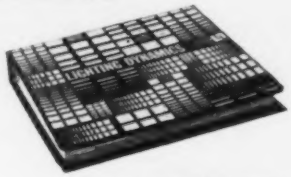
CATALOG



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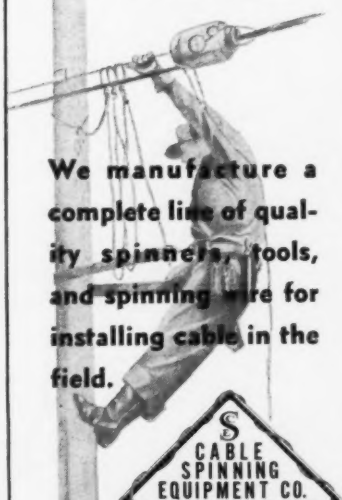
IN THE FIELD



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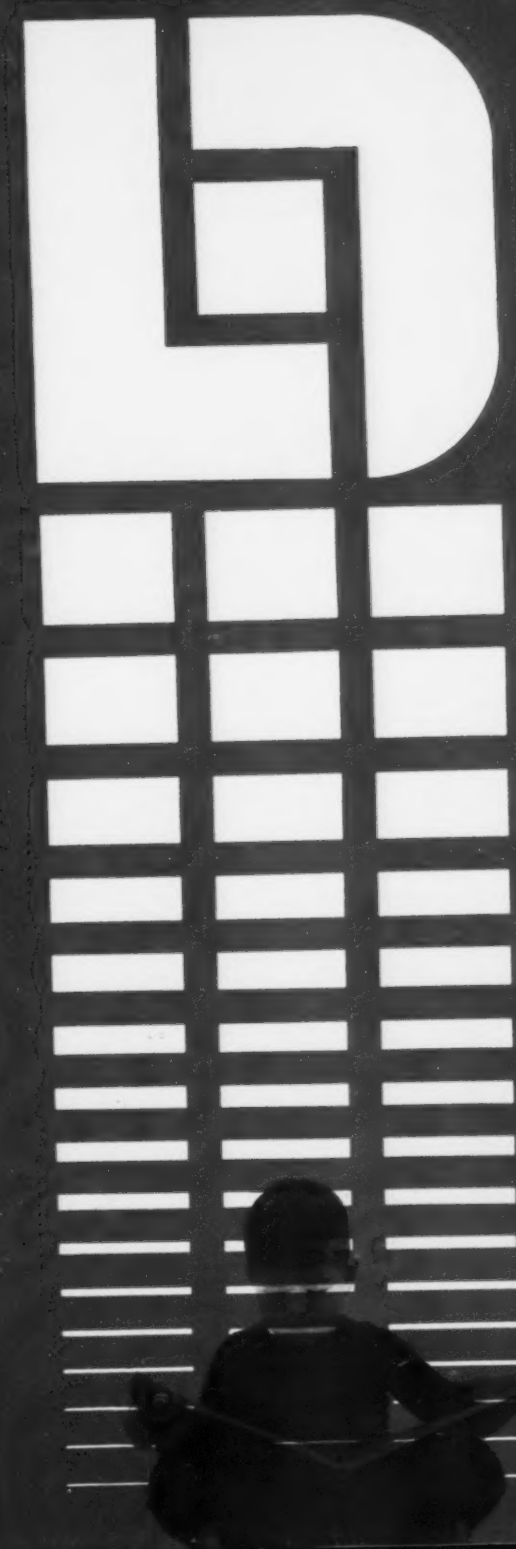

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The Atomic Age has created a host of new challenges. One is a coming revolution in lighting equipment. Our challenge: to design lighting fixtures for the whole man, satisfying both his emotional needs and physical requirements. To meet this challenge, ERCO PRODUCTS COMPANY, a seventy year old manufacturing complex with 35 plants around the world, has created LIGHTING DYNAMICS. ERCO has acquired the two modern manufacturing facilities and skilled personnel of RURY LIGHTING in Dallas and Los Angeles. A new development and design department has been organized. And to ensure the highest quality control there are new photometric laboratories, new Ransburg double electrostatic painting equipment, and a new multi-stage Bonderizing process. WRITE FOR: *the completely new catalog.* LIGHTING FOR TOMORROW'S MAN is the total objective of...

LIGHTING DYNAMICS

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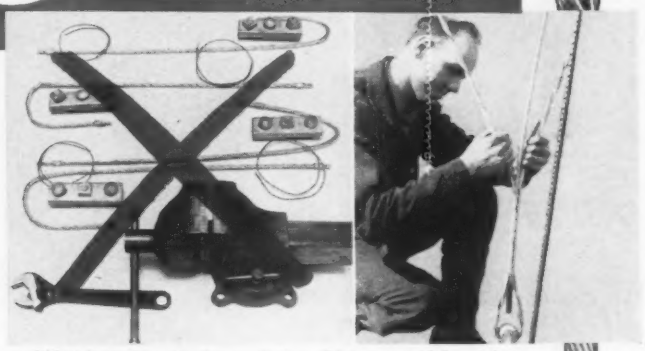
UP TO 49% $AVINGS
on materials alone
with
Fine Fanner Superformed
FANNGRIPS
FOR DEAD-ENDING GUY STRANDS



Old style costly methods are eliminated by the use of Fanngrips.

Now . . . costs compiled from typical guying methods using Fanner Fanngrips in comparison to other types of gripping devices show savings up to 49% *in materials alone* . . . in addition to the tremendous savings in time and labor!

Now . . . when savings are so important . . . here is more reason than ever to take advantage of the many Fanngrip features offered by no other type of gripping device:

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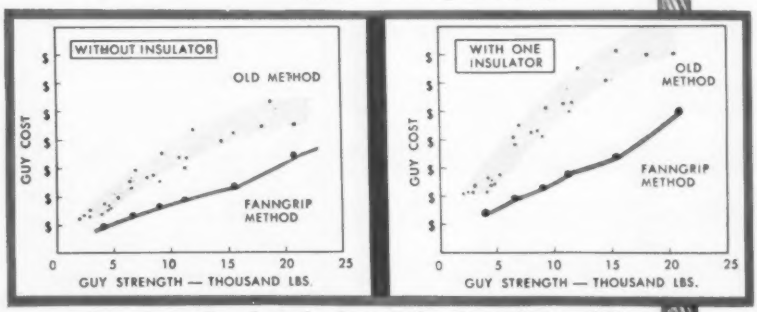
- Available in "B" or "C" coated galvanized steel, or copperweld.

Ask for cost-saving data today!



Two of a series of graphs demonstrating the savings available through Fanngrips over ordinary gripping methods.

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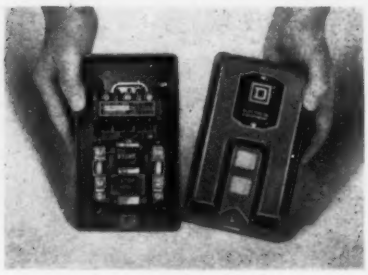
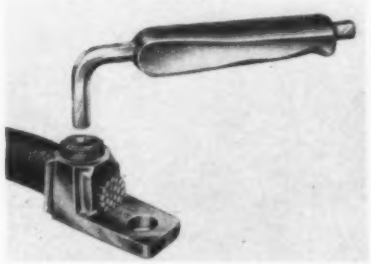


Manual Starters

(16) *Square D Co., 4335 Valley Blvd., Los Angeles 32, Calif.*

Now available from this company is a completely new line of integral horsepower manual starters, NEMA sizes 0 and 1, for control of motors up to 7½ hp. The new design features a heavy-duty, toggle action operating mechanism that is said to give positive snap-action opening and closing of the contacts with no dead-center position. Trip-free overload protection is provided by melting alloy-type relays. Self-centering pushbuttons give visual indication of an overload condition. Rated up to 600 v a-c or 250 v d-c, these starters are available in 2-, 3-, or 4-pole construction.

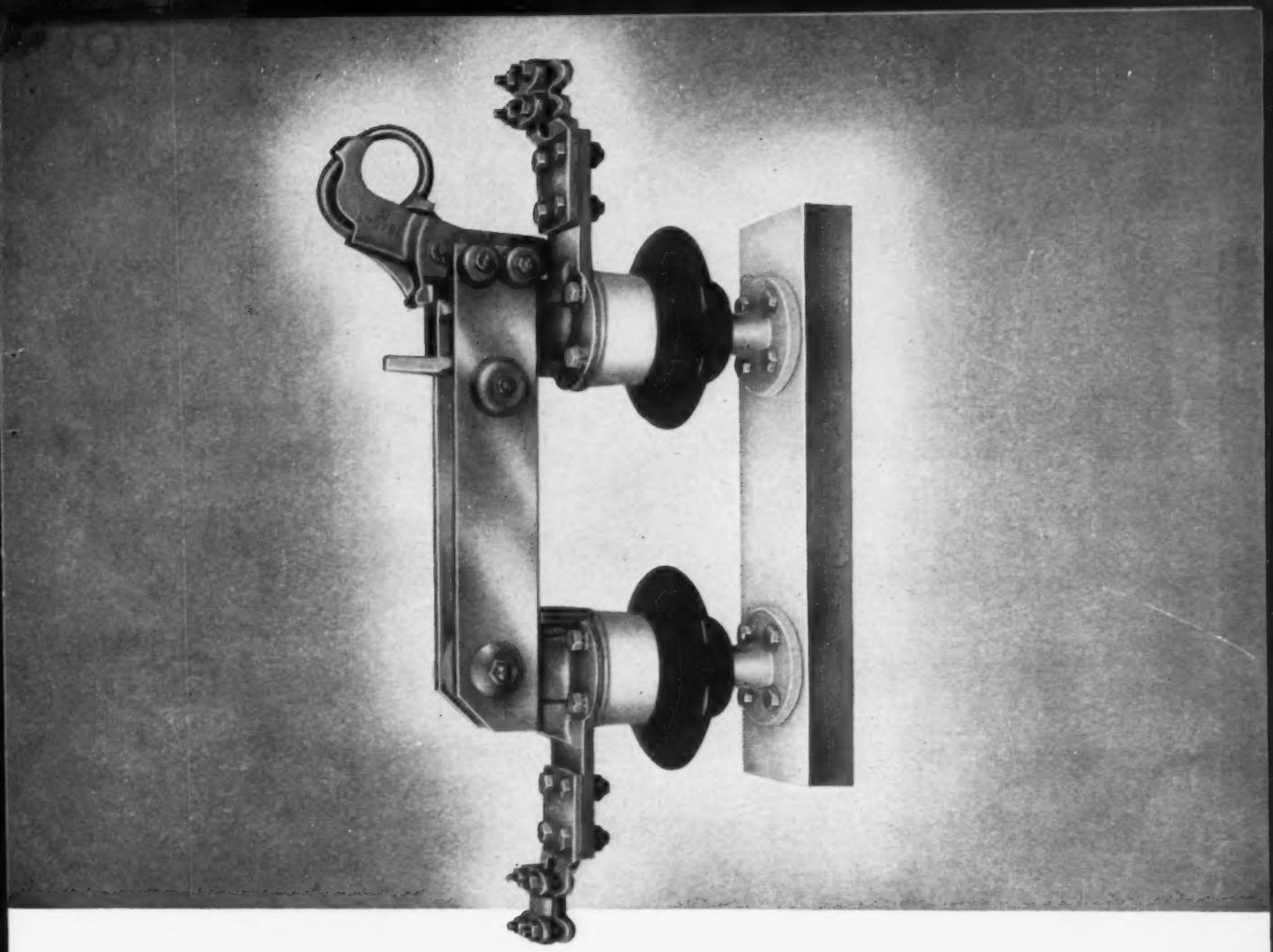


Cone-Screw Lugs

(17) *Thomas & Betts Co., Elizabeth, N. J.*

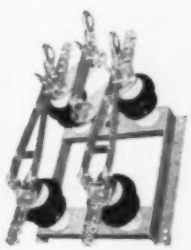
A new line of extra wide range cone screw lugs for terminating copper cable has been developed by this company. The heavy-duty terminals have a positive wire stop and cone screw for faster and more secure installation, the manufacturer reports. Available in six sizes to cover the range of cable from No. 14 AWG to 500 mcm.

For additional information on these products, fill in coupon on page 28.



There is an Important Difference in this Southern States Disconnect

TYPE PBO-R



This regulator by-pass switch offers a compact unit that provides disconnecting means needed to by-pass and isolate voltage regulators. Available in ratings of 7.5 — 15 kv — 400, 600, and 1200 amps.

All hookstick-operated disconnects are simple devices. There are no intricate mechanisms — nothing complicated in their design or construction.

Certain highly desired features are fairly well standardized on disconnects being marketed today: positive latching of the blade in its closed position; a blade pryout; guides to position the blade when closing; and high pressure line contacts.

Yet there is an important difference in disconnects!

You can't see it feature by feature. It is apparent only when you take a good, studious look at the complete unit. For then you see how all of the features blend together to give you a sturdy, rugged and highly dependable piece of equipment.

Take a look at the Southern States PBO Disconnect illustrated above and you'll see what we mean.

For the full story, see your Southern States representative, or write for Bulletin 55 PBO.

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EQUIPMENT CORP.
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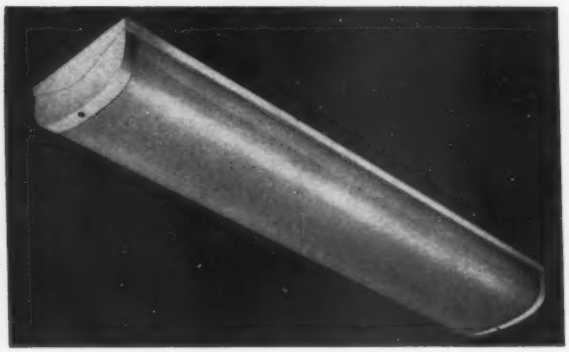
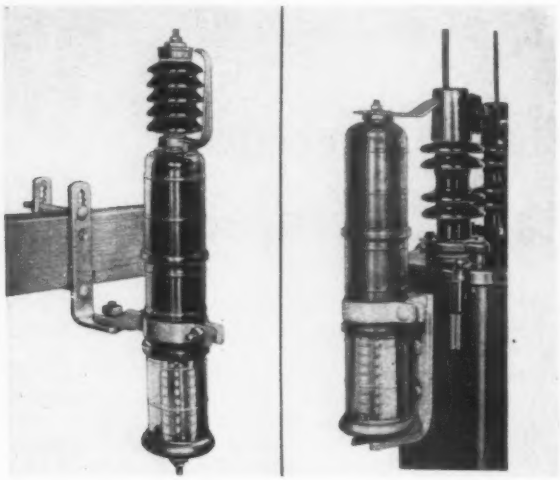


Unbreakable Fixture

(18) *Lighting Dynamics,* 802 *W. Whittier Blvd., Whittier, Calif.*

This new fluorescent light fixture is especially designed to withstand vandalism and violent handling. It fits flush against ceiling or wall and can be opened for relamping only with a special tool. When closed, the fixture is said to be dustproof, bugproof and waterproof, and can be washed down with a hose at full pressure. The manufacturer recommends it for use in public subways, pedestrian tunnels, comfort stations, under overpasses and similar locations where rough usage can be expected.



Gap Arresters

(19) *Line Material Industries, McGraw-Edison Co., Milwaukee* 1, *Wis.*

These new heavy-duty arresters, housed in Pyrex, combine an external gap with the excellent electric characteristics of valve and internal-gap construction. Available voltage ratings of the new arresters are 3, 6, 9, and 10 kv. Arresters for crossarm, pole and wall mounting, designated type TX, have an external gap insulator. Type T arresters are mounted directly on transformers or regulators. The Pyrex housing is said to provide positive and constant visible evidence of an arrester's ability to give protection.

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Production schedules are arranged to meet your delivery dates—on single, special-unit or quantity orders. Central West-coast location cuts transit time and reduces shipping costs.

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BULLETINS ETC.

(20) HOUSEPOWER GUIDE—Wadsworth Electric Mfg. Co. Inc., Covington, Ky., is offering its newest guide for housepower controls. The guide contains more than 100 pages of technical information, cabinet sizes, knockout arrangements and other information for a number of Wadsworth products. A simplified index makes the guide easy to use.

(21) CABLE SUPPORT SYSTEM—A new 60-page looseleaf catalog, containing the latest information on the complete line of cable supporting systems by T. J. Cope Division, Rome Cable Corp., Collegeville, Pa., is now available. In addition to the company's complete steel line, the new catalog also features aluminum trough, ladder and channel, which is also a complete line. Dimensional detail sheets are contained in the catalog.

(22) FIXTURES—Leadlight Fixture Co., 800 100th Ave., Oakland, Calif., announces its new catalog showing the new and expanded lines of both industrial and commercial fluorescent fixtures. It is now available to all engineers, architects, contractors and industrial designers.

(23) LIGHTING CATALOG—This is the first catalog of a new lighting fixture manufacturer, Lighting Dynamics, 802 W. Whittier Blvd., Whittier, Calif. Besides the usual fixture illustrations and photometrics for use by engineers, the catalog contains idea renderings for use by architects, and detailed mounting information and price list for the benefit of contractors. Photometrics are all calculated with the IES's interflectance method. Features are: a simplified ordering system and complete lamp information in easy-to-use tables for wholesalers.

(24) ALUMINUM BUILDING WIRE—A useful new booklet on aluminum electrical building wire has just been published by Kaiser Aluminum & Chemical Sales Inc., 919 N. Michigan Ave., Chicago 11, Ill. Information is selected to be of particular value to electrical contractors, engineers, architects and purchasing agents. Several pages of charts give such information as properties, current carrying capacities, dimensions, voltage drop calculations and breaking strengths of aluminum electrical conductor. Address your request to Department NR-9.

(25) BUSWAY—General Electric's new 225-1,000-amp plug-in Flex-A-Power busway with aluminum conductors is the subject of a new 24-page book issued by the Distribution Assemblies Department, Plainville, Conn. The busway is designed for indoor use as a plug-in or feeder system in industrial plants and commercial buildings.

(26) DISTRIBUTION CATALOG—Low-voltage distribution equipment and components are the subject of a new 144-page 1958 general catalog issued jointly by the Circuit Protective Devices and Distribution Assemblies Departments of General Electric Co. The catalog provides condensed information on all products of the two departments. Ask for GEC-1032B. Write to Distribution Unit, General Electric Co., Plainville, Conn.

KILL TWO BIRDS WITH ONE STONE—Fill out this coupon and get back valuable information from as many sources as you indicate.

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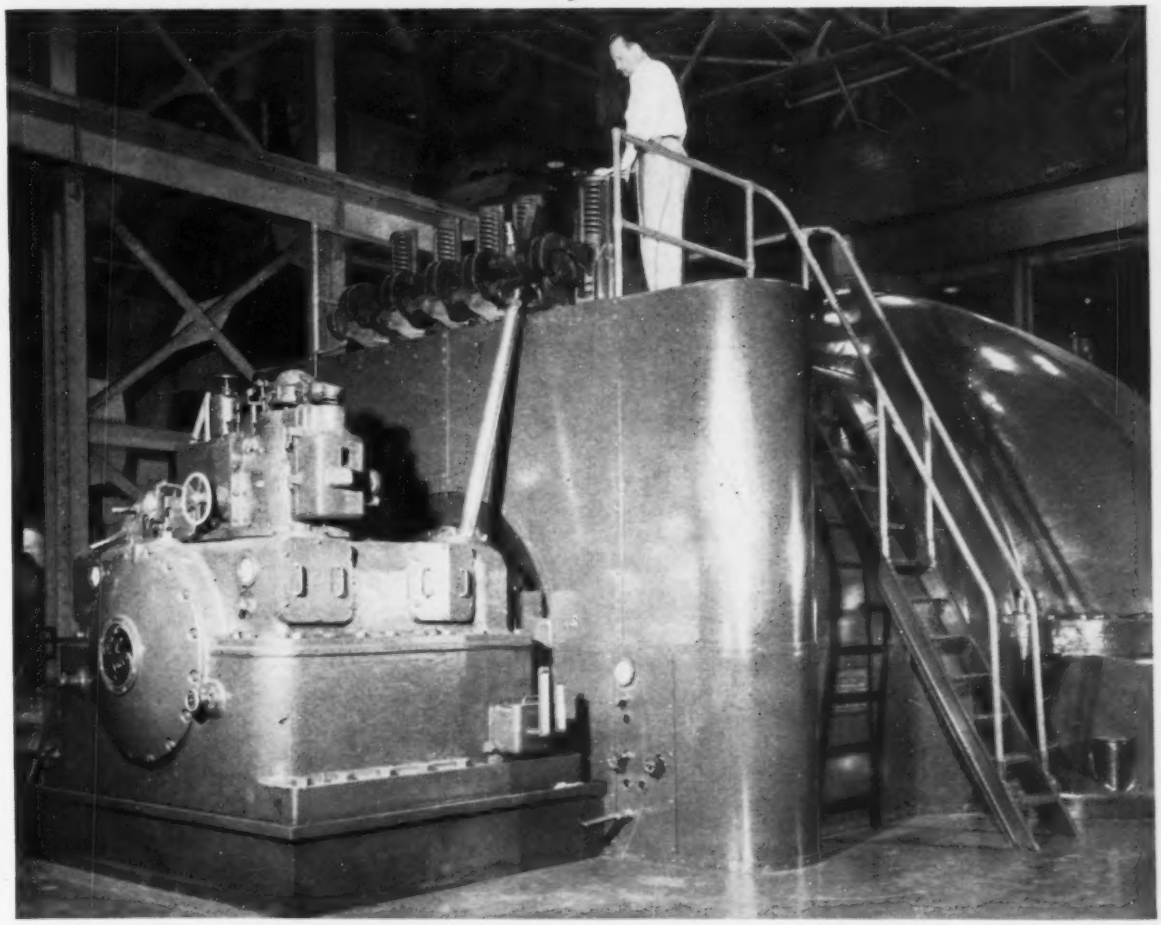
FIRM U.S. STEEL CORP. Geneva, Utah

Oil Neutralization No. only .07 after 100,000 hours



Chevron* OC Turbine Oil is used in this General Electric turbine which is the principal source of power for United States Steel Corporation's mill at Geneva, Utah. After 100,000 hours operation the oil in this 50,000-kw turbine-generator showed a neutralization number of just .07—identical with the number of the original 7,000 gallon charge made in 1943. During regular inspection and servicing periods, the oil was drained, purified, and put back in service. No "sweetening" of the oil, and no other down time was required during the entire 100,000 hour period. Chevron OC Turbine Oil is also used in mill's four 11,350 hp turbo-blowers.

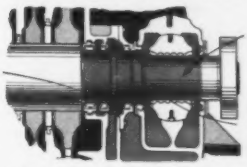
For More Information about Chevron OC Turbine Oils call your Standard Representative, or write 225 Bush Street, San Francisco 20, California.

*The Chevron Brand covers the line of industrial products formerly sold under the Calol name. This is a name change only. The high quality and specifications remain the same.

CHEVRON Industrial Lubricants

TRADEMARK "CHEVRON" AND DESIGN REG. U.S. PAT. OFF.

Why Chevron* OC Turbine Oil prevents sludging, rusting and wear



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- Oxidation inhibitor prevents sludge, gum, and lacquer formations
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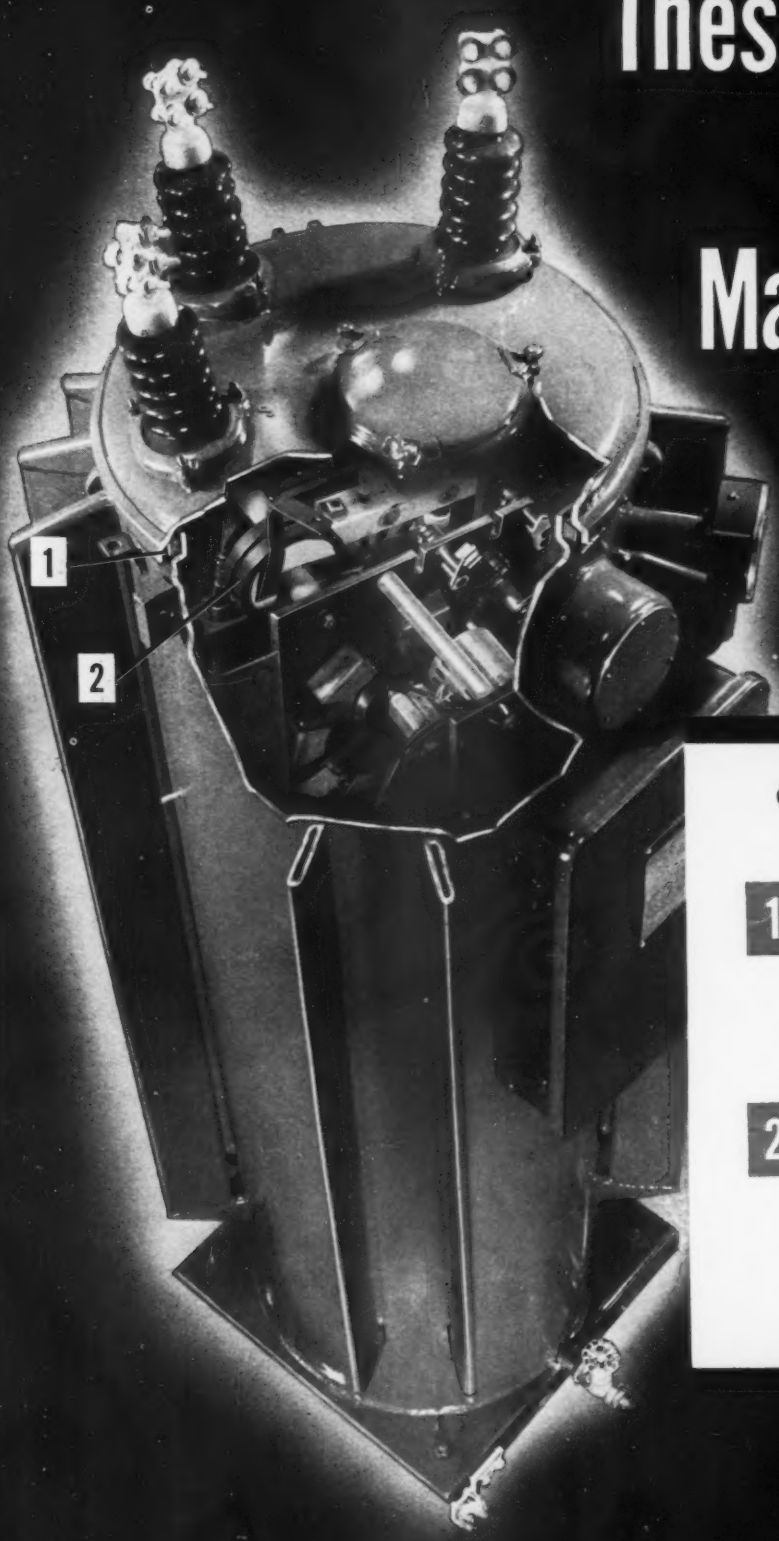
These Features Reduce Maintenance, make....



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1 **COMPLETELY SEALED TANK** plus one-piece cover-clamping band provides protection against entrance of oxygen or foreign matter . . . prolongs oil life, reduces maintenance.

2 **INTERNALLY MOUNTED THYRITE*** by-pass resistor offers added surge protection right in the regulator itself. Internal bypass is protected from external damage.

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Unique electrical protection and optimum-life switching mean longer life, far less inspection and maintenance with G-E voltage regulators

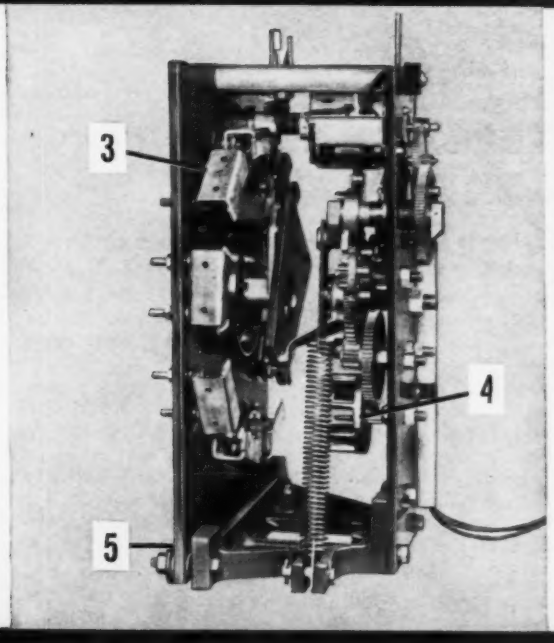
General Electric's ML-32 step regulator costs you less on the line because it requires less maintenance. You can apply this dependable regulator to your system, and not have to untank it for over twenty years of normal use. (Compare inspection recommendations of other regulators!) This unusually long life is made possible by such features as the completely sealed tank, electrostatic shielding, and optimum-life switching.

General Electric regulators cost less on the line because of the greatly reduced possibility of surge damage. This results from the application of an internally mounted Thyrite by-pass resistor. This superior protective material adds years to regulator life, and the device itself is not subject to damage in shipment or handling, as an external device would be.

Combined with longer life and superior protection, you get a regulator built with the highest industry classification of control accuracy—plus-or-minus 1 percent. This Class 1 Accuracy is standard on all ML-32 step regulators.

You'll want to know more about these cost-reducing features. Write to Section 423-27, General Electric Company, Schenectady, New York, or call your nearest Apparatus Sales Office or Agent.

..... General Electric Regulators Cost Less On The Line



LONGER LIFE

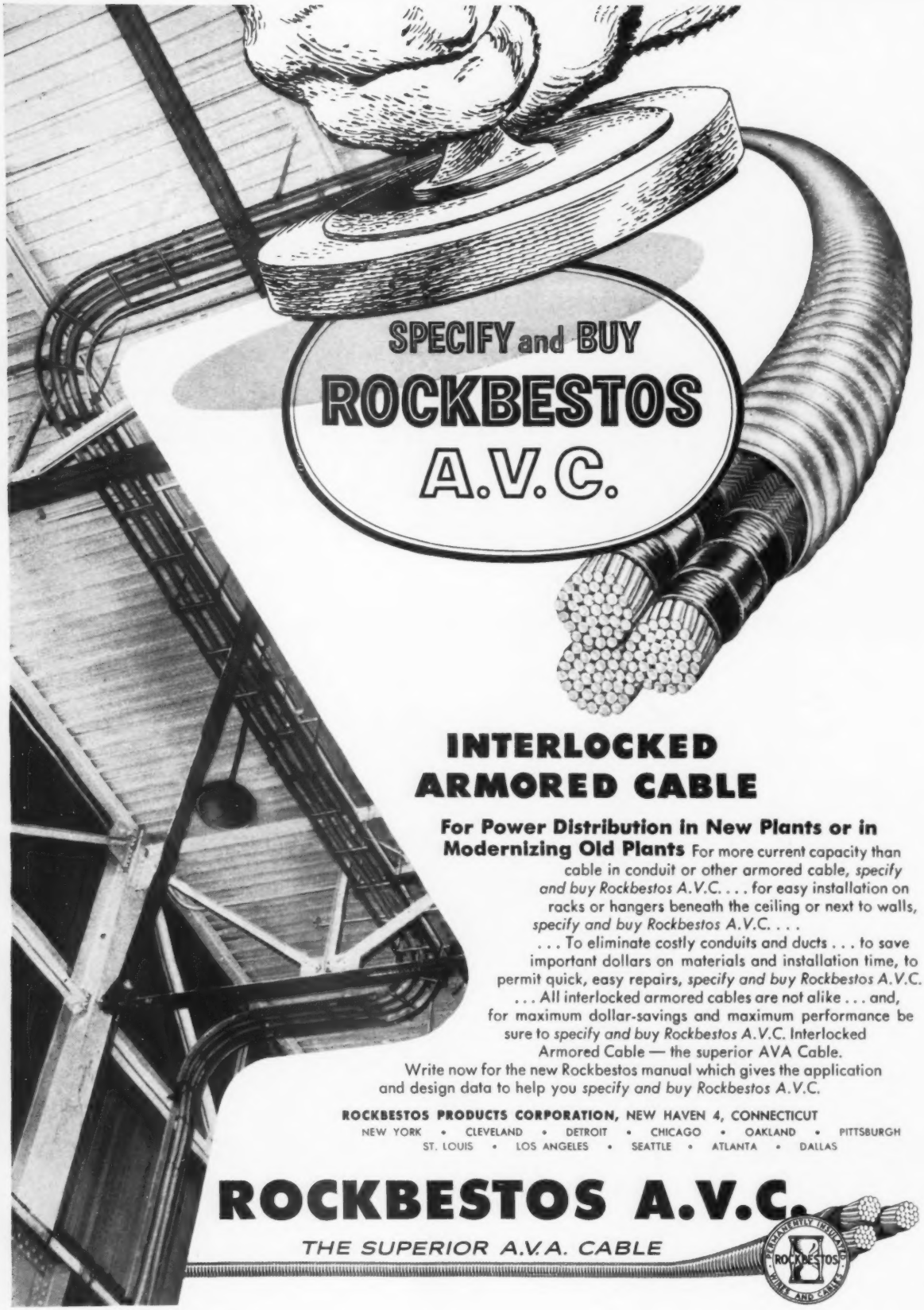
3 **NEW HEAVY-DUTY SWITCH** is used on higher-rated units to withstand your growing current requirements. Heavier contacts bring life of even highest-current regulators up to that of smaller, light-duty units.

4 **CONTROLLED SWITCHING SPEED,** provided by oil-immersed impeller on G-E optimum-life switch, extends switch life. The actions of the impeller and spring are coordinated to control switching speed, keep contact arcing to a minimum.

5 **ELECTROSTATIC SHIELDING** diverts electrostatic creepage paths . . . further reduces maintenance requirements. Tracking and carbon buildup are minimized. Result: Contacts can be completely eroded without deteriorating insulating strength of the oil to a hazardous value.

Progress Is Our Most Important Product

GENERAL ELECTRIC



INTERLOCKED ARMORED CABLE

For Power Distribution in New Plants or in Modernizing Old Plants For more current capacity than cable in conduit or other armored cable, *specify and buy Rockbestos A.V.C.* . . . for easy installation on racks or hangers beneath the ceiling or next to walls, *specify and buy Rockbestos A.V.C.* . . .

. . . To eliminate costly conduits and ducts . . . to save important dollars on materials and installation time, to permit quick, easy repairs, *specify and buy Rockbestos A.V.C.* . . . All interlocked armored cables are not alike . . . and, for maximum dollar-savings and maximum performance be sure to *specify and buy Rockbestos A.V.C.* Interlocked Armored Cable — the superior AVA Cable.

Write now for the new Rockbestos manual which gives the application and design data to help you *specify and buy Rockbestos A.V.C.*

ROCKBESTOS PRODUCTS CORPORATION, NEW HAVEN 4, CONNECTICUT

NEW YORK • CLEVELAND • DETROIT • CHICAGO • OAKLAND • PITTSBURGH
ST. LOUIS • LOS ANGELES • SEATTLE • ATLANTA • DALLAS

ROCKBESTOS A.V.C.

THE SUPERIOR A.V.A. CABLE

High costs got you over a barrel?

See how you can save money on turbine maintenance with

Shell Turbo Oil

the modern turbine lubricant

Shell Turbo Oil cuts maintenance costs because it was *specifically developed* to counteract rust and sludge—the two major causes of turbine wear.

Long after ordinary oils fail, Shell Turbo stops these turbine hazards, shows little change in properties. (Actual case histories show some original charges of Shell Turbo are still effective after nearly 20 years!)

Now is the time to prove to yourself how Shell Turbo can help cut turbine maintenance costs. Call your Shell representative this week.

SHELL

SHELL TURBO OIL

- ✓ **contains most effective rust inhibitor known**
- ✓ **cools and cleanses efficiently**
- ✓ **ends foaming**
- ✓ **developed by lubricant specialists at Shell research laboratories**

QO® —THE FINEST NOW IS EVEN

QWIK OPEN

DEMONSTRATION PROVES IT!

Square D Field Engineers throughout the country are proving the superior performance of the **QO** breaker, using the demonstration kit shown above. It gives dramatic proof of positive protection against "flash" shorts. Mail the coupon on opposite page for the complete **QO** story. If you're of the "I'm from Missouri" clan—

MAKE A "DEMONSTRATION" DATE WITH YOUR SQUARE D FIELD ENGINEER!

Conventional overcurrent protectors provide protection for branch wiring for both overload and short circuits, but do not open fast enough to protect the smaller extensions beyond the branch wiring from repeated arcing or "flash" shorts. Such shorts consist of relatively low values of current and often produce spectacular flashes.

Square D's **QO** breaker now gives you positive protection against "flash" shorts, in addition to its many other advantages. This added protection costs no more—why settle for less?

EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

SQUARE D COMPANY

BREAKER EVER BUILT BETTER...*and Here's Why*—

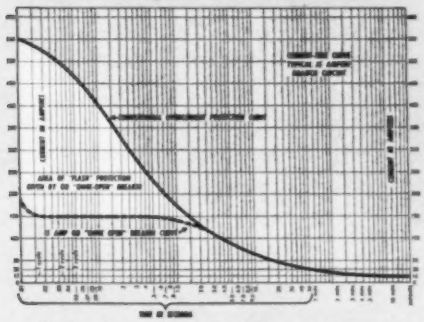
ACCIDENTAL "FLASH" SHORT

Accidental "flash" shorts occur by a slip—a screwdriver on a terminal, a fork in a toaster, a screw falling on a bus, a loose wire. The circuit should open instantly. With **QO** "Qwik-Open" breaker, the circuit opens *instantly* with the first flash, making the circuit safe.

FRAYED CORD "FLASH" SHORT

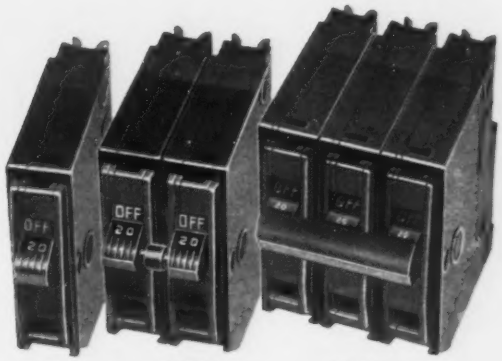
Stranded flexible cord "flashes" result principally from frayed cords. A few strands touch—the high resistance circuit gives off enough heat to burn through several strands. Further movement usually causes more strands to touch—another flash. With **QO** "Qwik-Open" breaker, the circuit opens *instantly* on the first flash. No known protection is faster.

TIME-CURRENT CURVE SHOWS QO PERFORMANCE



In the above chart, the **QO** curve illustrates the time-delay characteristic which eliminates nuisance tripping on momentary overloads and motor starts *plus* the extra protection over conventional protective devices which **QO** Qwik-Open breaker gives on the arcing "flash" shorts.

QO Gives Positive Protection Against Both Kinds of "Flash" Shorts!



1-POLE 15-50 Amps | 2-POLE 15-70 Amps | 3-POLE 15-50 Amps

And—You Don't Need a "Road Map" To Use Square D's QO Breakers!

NO GUESSWORK! There's just ONE ARRANGEMENT. 2-pole breakers go anywhere on the bus assembly. You don't need a wiring diagram to tell you where to put them. No limit on number of 2-pole breakers you can use. The same applies on 3-pole breakers for 3-phase jobs.

ONE FULL-SIZE BREAKER! Each pole in its own case and all poles are the same size. Double-pole breakers take only two single-pole spaces—3-pole breakers only three. No more.

LESS MONEY TIED UP IN STOCK! Only one kind of breaker for all load centers—no duplicate stocks. The same breaker for panelboards—no duplicate stocks.

HOT OFF THE PRESS! MAIL COUPON FOR 16-PAGE BULLETIN ... GET THE COMPLETE STORY

Square D Company, Dept. SA-10
4335 Valley Boulevard, Los Angeles 32, California

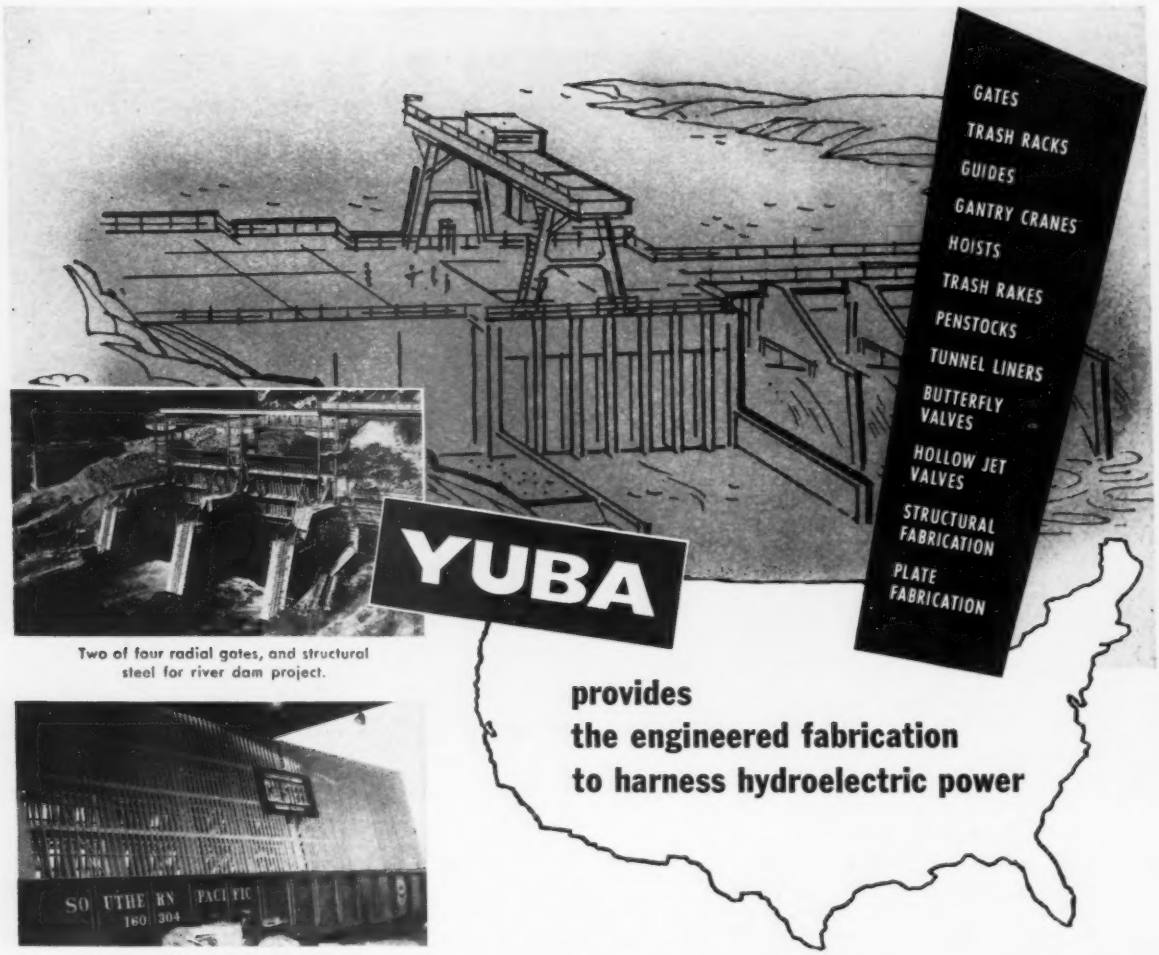
Please send me a copy of the new **QO** Bulletin

Name _____

Company _____

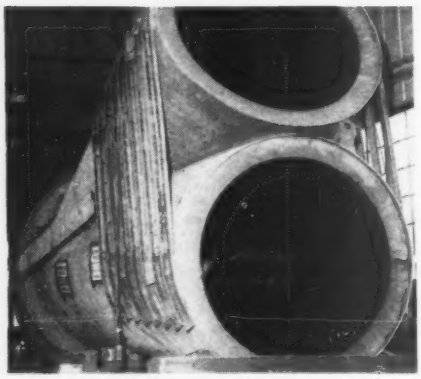
Address _____

City _____ Zone _____ State _____



Two of four radial gates, and structural steel for river dam project.

Part of 3,000 ton trashrack shipment.



105" Wye for western powerhouse.

As a major source of fabricated and machined components and assemblies – to any geographical location – Yuba offers through Calsteel, Yuba Manufacturing, and Adsco Divisions, a unique combination of experience, skills and facilities. Each has gained prominent recognition for products and services through many decades. Now integrated through Yuba Consolidated Industries, Inc., their combined know-how and facilities are available under a "package responsibility" – with the time-saving economy and convenience of working with a single organization as near as your telephone. Whatever your needs in harnessing the force behind hydroelectric power – you'll like doing business with Yuba.

YE-801

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Benicia, California

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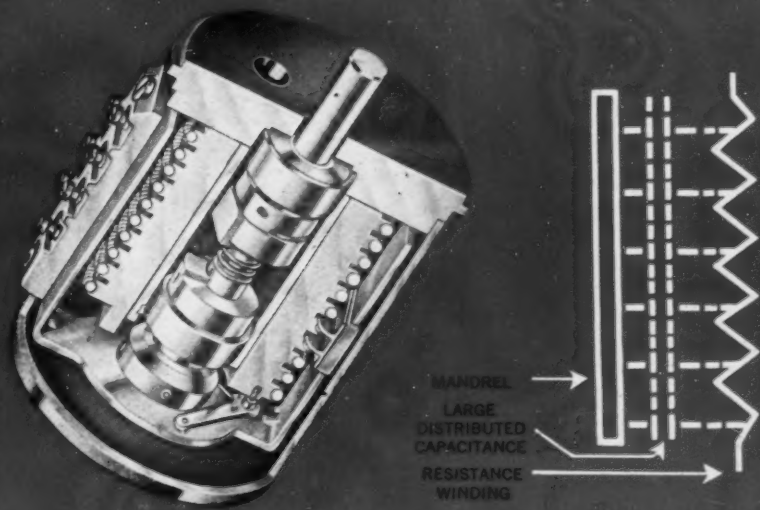
Buffalo, New York

DRIVER-HARRIS ALLOYS AT WORK IN PRODUCT ADVANCEMENT



Phase Shift Compensation Eliminated In New HELIPOT* Precision Potentiometers

SPECIAL D-H ALLOYS MAKE AIR-CORE WINDINGS PRACTICAL!

Helipot's purpose in designing its new, air-core wound series 7700 Potentiometers was to make possible operation at higher frequencies with 0° phase shift—thereby eliminating compensation circuitry.

In nearly all multi-turn potentiometers, resistance wire is wound on an insulated copper-wire mandrel. This type of mandrel is used because it has uniform diameter, good heat conductivity and high thermal capacity. However, a disadvantage of such construction is the relatively large distributed capacitance between the resistance winding and the mandrel. When such a potentiometer is used as an AC voltage divider, the output generally differs in phase and magnitude from the desired output. This interferes with the effective use of high accuracy potentiometers unless compensation is applied somewhere in the circuit.

Helipot engineers desired to eliminate these problems by eliminating the copper-wire mandrel. But the elimination of the mandrel also eliminated the support for the winding. Needed, therefore, was a type of wire that would make a self-supporting air-core winding.

At Helipot's request, Driver-Harris went to work with these specifications: The wire must be of dependable uniform hardness so that in stretching it, equal spacing between turns is obtained, free of creep. This is essential to linearity. The wire also must be of unvarying diameter for uniform resistance. And its surface must be extremely clean—free of oxide coating to minimize contact "noise".

Driver-Harris produced the wire—a special hard-drawn form of Karma* and Nichrome* V. And Helipot produced its new 10-turn series 7700 potentiometers in a resistance range from 200 to 5000 ohms. With this radically new air-core winding, linearity approaches the resolution of the unit without resort to padding or shunting. And phase shift in AC circuitry is reduced to less than 0.1°.

Since 1899, Driver-Harris has produced 132 special-purpose alloys in just this fashion—in answer to a particular problem and extraordinary specifications. If your own engineering and product development plans currently hinge upon a special alloy—why not bring your problem to Driver-Harris. Your inquiry is invited.

*T.M. REG. U.S. PAT. OFF.

Driver-Harris* Company

HARRISON, NEW JERSEY • BRANCHES: Chicago, Detroit, Cleveland, Louisville
Distributor: ANGUS-CAMPBELL, INC., Los Angeles, San Francisco • In Canada: The B. GREENING WIRE COMPANY, Ltd., Hamilton, Ontario

MAKERS OF THE MOST COMPLETE LINE OF ALLOYS FOR THE ELECTRICAL, ELECTRONIC, AND HEAT-TREATING INDUSTRIES

Here's a simple "one-step" plan to ease your distribution growing pains

. . . SINGLE RESPONSIBILITY WITH WESTINGHOUSE UNIT SUBS

Whenever system load growth requires another substation, there's a simple solution . . . Westinghouse designs and manufactures all the components of a unit substation . . . coordinated and engineered to work together . . . complete and ready to install. Here in *one* set of specifications, *one* source, *one* contact man is the answer to your distribution problems. Quiet operation and neat, uncluttered appearance of Westinghouse substation transformers are important in making them good neighbors. Dependability, convenience of operation, ease of maintenance are the products of research and development. Some of the plus features which the Westinghouse salesman will be glad to discuss with you are costal finish, Hipersil® cores, and proven impulse and short circuit design.

Shelterfor-M metal-clad switchgear provides all-weather maintenance protection for your switchgear . . . encloses common operating and drawout aisle. Eliminates front and rear doors, need for expensive concrete pads and unsightly temporary structures. The compact design saves valuable real estate.

You can be relieved of time-consuming engineering and purchasing details in building your next substation . . . and receive the counsel of Westinghouse regional application engineers and product specialists, headquarters system planners and local equipment installation and field service engineering by calling your Westinghouse sales engineer. For more information, write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

J-60944

WESTINGHOUSE UNIT SUBS MAKE GOOD NEIGHBORS

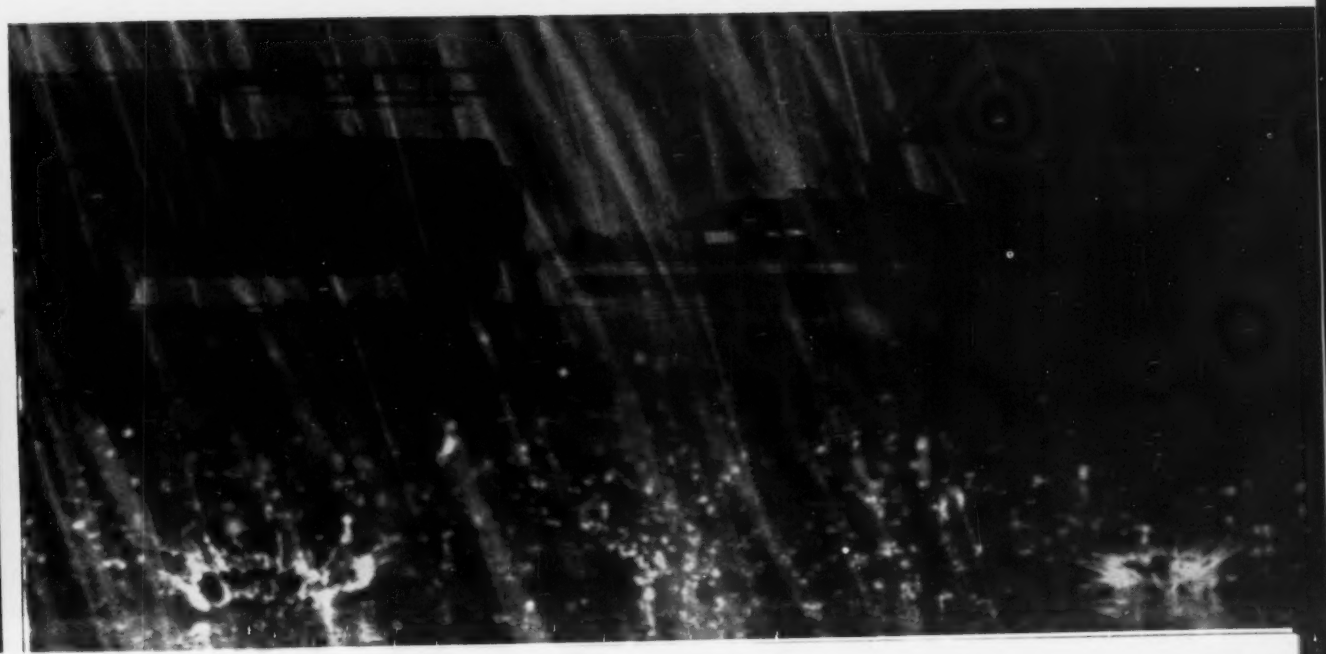
Shelterfor-M switchgear does not require concrete service and drawout pads, allowing grass and shrubbery to be planted right up to the walls. Clean, modern lines make this substation unobtrusive in residential areas.

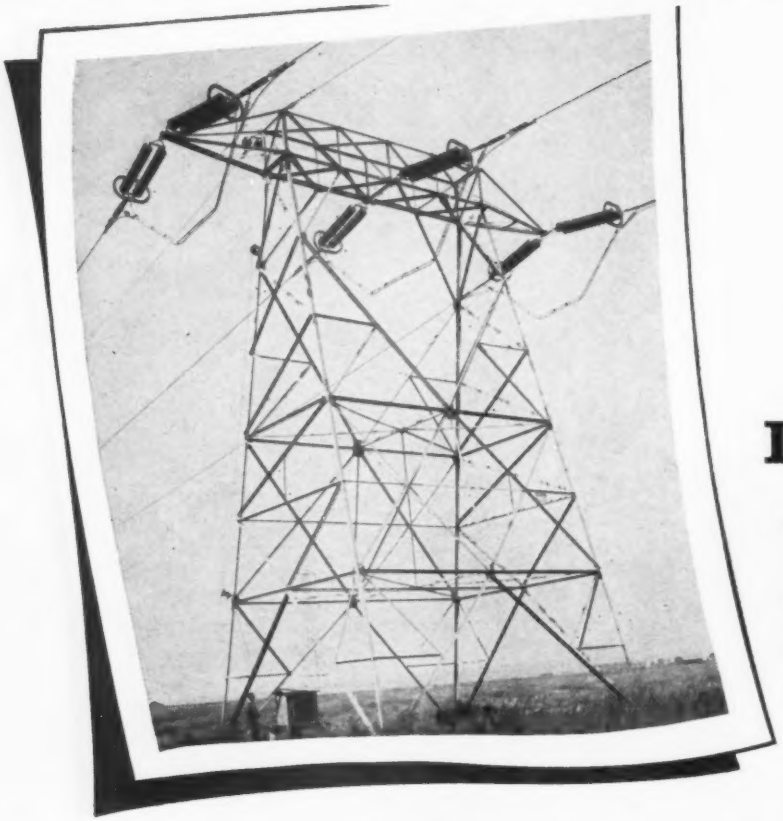
Extensive research in the Sharon half-million-dollar sound labs has produced a substation transformer that is the leader of the industry for quiet operation. Here is a combination of pleasant appearance and quiet performance that makes Westinghouse unit subs *easy to live with.*

YOU CAN BE **SURE**...IF IT'S

Westinghouse

With Shelterfor-M switchgear, your maintenance schedule can be carried out regardless of weather — no more rainy-day delays. When necessary, emergency servicing can be done without tarpaulins or other makeshift shelters.





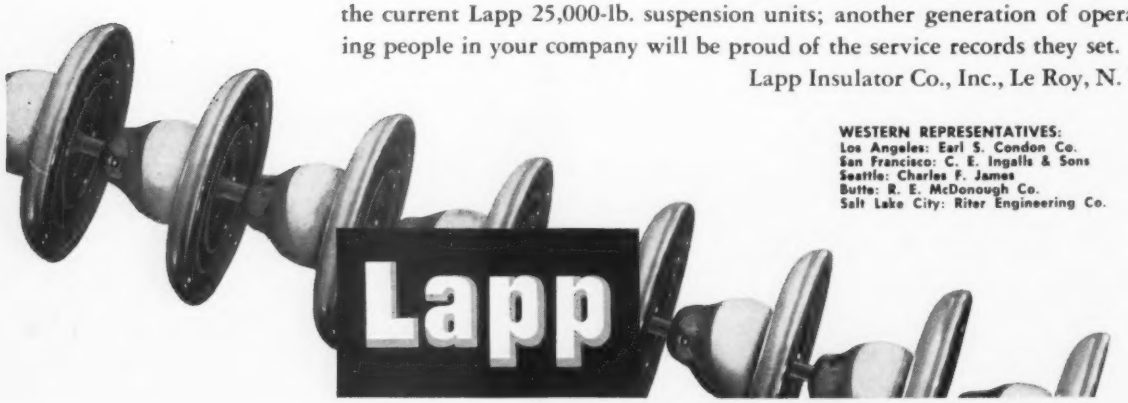
In 1923 this was EHV

Lapp "high strength" suspension insulators were used by Southern California Edison Co. for its 220 kv Eagle Bell line. Erected in 1923, this line is now in its 35th year of service. Original insulators are still in place. Company reports "no trouble"; total replacement of insulators for all causes over 34 years is "less than 1%."

"Design for electrical security and long life—then do all you can to make it strong." This has been a Lapp principle from the beginning. In 1923, when the line shown above was erected, the insulators on it were cataloged as 18,000-lb. units—at a time when the industry was talking generally of 9,000-lb. and 12,000-lb. units. Before, and since then, Lapp has pioneered in insulators that combine long life with high mechanical strength.

For your EHV and other high-mechanical-loading requirements, specify the current Lapp 25,000-lb. suspension units; another generation of operating people in your company will be proud of the service records they set.

Lapp Insulator Co., Inc., Le Roy, N. Y.



WESTERN REPRESENTATIVES:
Los Angeles: Earl S. Condon Co.
San Francisco: C. E. Ingalls & Sons
Seattle: Charles F. James
Butte: R. E. McDonough Co.
Salt Lake City: Riter Engineering Co.

NEW! and packed with profits!

the virden Sunshine® Ceiling

V-8046. Complete packaged ceiling $73.25 list. Slightly higher west of the Rockies.

A 4' x 6' "Packaged" Unit for Bathrooms, Kitchens For New Homes...Old Homes...Modernization

The new Virden Sunshine Ceiling.* A complete packaged unit that installs quickly and easily to any ceiling surface. Electrical channel system fastens to ceiling — satin white suspended grid holds plastic diffusers (8½" drop). Uses six 100W incandescent lamps to flood the room with even, glare-free "sunshine". A sure-fire sales clincher in new homes. A terrific plus-profit maker for use in existing homes or on modernization jobs.

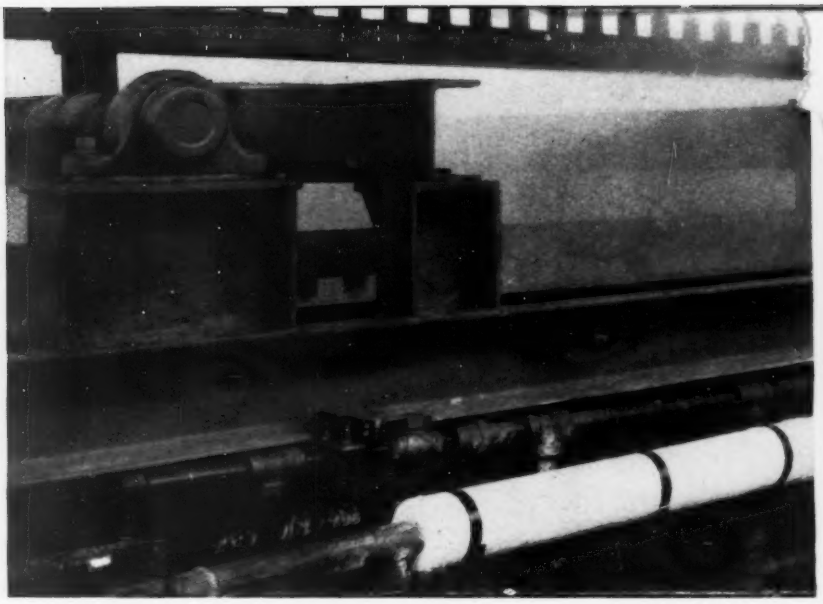
Luminous ceilings promise to be the next big development in home lighting. Virden brings it to you now in a complete easy-to-install package. Plan now to use it in your next job, new or old. See the model now on display at your Virden distributor, or write John C. Virden Co., Dept. ELW, 6103 Longfellow Ave., Cleveland 3, Ohio.

VIRDEN Lighting®

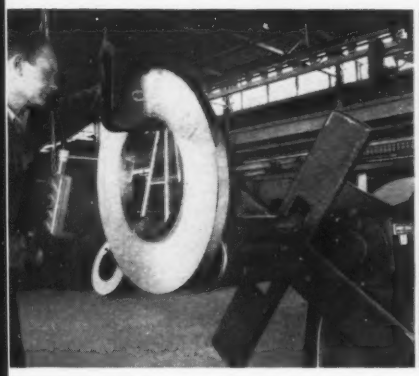
virden

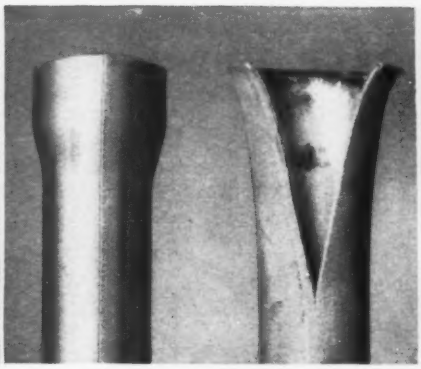
Member American Home Lighting Institute

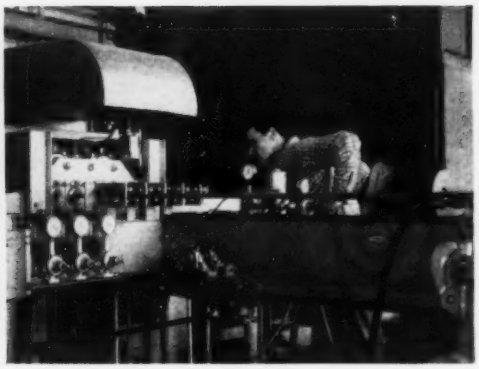
* Patent No. 2,659,807



NEWS! Now Circle's







Proper steel plus!

The best cold rolled steel, unless properly fabricated and finished, will lose its ductile properties. Circle processes are designed to retain the natural bendability of the selected high grade steels it uses for CIRTUBE EMT.

Better welding makes a difference!

Note how ordinary EMT split early in pressure test while induction welded CIRTUBE EMT held fast, surpassing minimum UL requirements. High frequency induction welding not only means bead-free welds for easier fishing—but stronger tube as well.

The fishability is all in the finish!

You need more than a slick surface to make wire pulling easy. You also need a sort of built-in lubrication. A baked-on protective coating containing special wax-like ingredients gives CIRTUBE EMT this property.

Lifetime exterior finish!

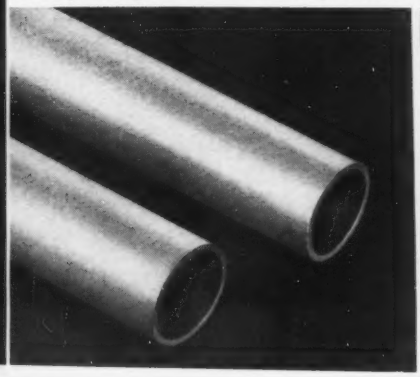
No matter how severe the bends, there's no chip, no flake, no peel. The galvanized finish is hard for durability; has a polished satin lustre for lasting good looks. A completely automatic, electronically controlled process guarantees this uniform protection.

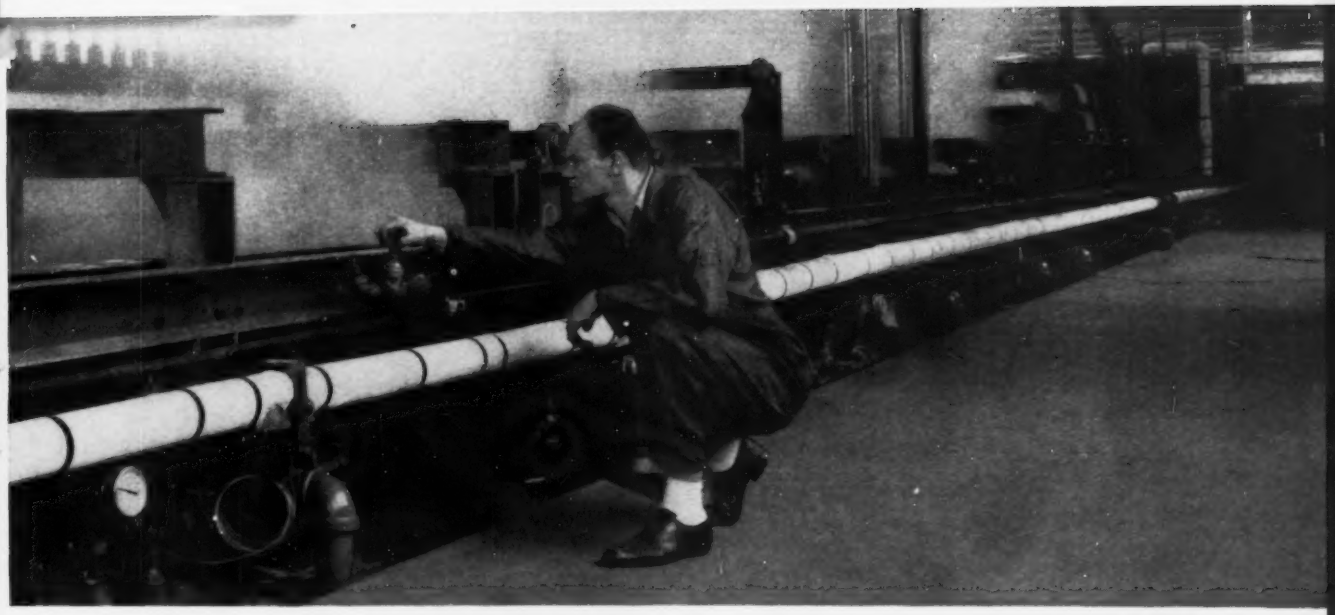
Automated quality control!

Very little has been left to human error in the manufacturing control of CIRTUBE EMT. Wherever possible, completely automatic controls have been built into equipment to assure contractors complete and continuing uniformity of product.

Tight, easily handled bundles!

Circle has automated every possible operation to make your job easier. Bundling, for example, is completely automatic. Distinctive orange colored tapes identify CIRTUBE EMT, hold bundles securely together for easier handling on and off the job.





making CIRTUBE EMT

New plant, ultra modern equipment, special techniques combine to produce new CIRTUBE EMT — unsurpassed for quality and workability

IT TOOK well over two years of extensive research to develop CIRTUBE EMT *

First we surveyed the needs of the contracting industry. Then we investigated the latest manufacturing methods and techniques, examined available equipment and materials — even hired a famous consulting engineering firm to design special machines.

Behind all of this we put Circle's 37 years of know-how and skill developed in manufacturing a top quality line of building wire and cable.

PURPOSE: to produce EMT with the right combination of bendability, fishability, durability, and appearance.

The final result is CIRTUBE EMT — a quality electrical metallic tubing that permits contractors to make better, faster, more profitable wiring jobs.

CIRTUBE EMT is at your Circle wholesaler's now. Try it! You'll like working with it.

* T. M.

Fast, friendly service!

First with building wire and cable — and now with CIRTUBE EMT. Wholesalers and contractors are assured of the same fast, dependable service through Circle's nationwide network of 22 well-stocked warehouses.

CIRCLE WIRE & CABLE
a subsidiary of
CERRO DE PASCO CORPORATION

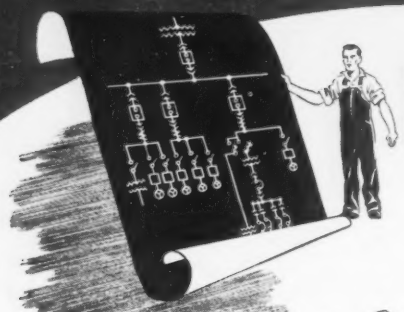
PLANTS: Maspeth and Hicksville, N. Y. **SALES OFFICES & WAREHOUSES:** in all principal cities

RUBBER COVERED WIRES & CABLES • VARNISHED CAMBRIC CABLES • PLASTIC INSULATED CABLES
NEOPRENE SHEATHED CABLES • "CIRTUBE" EMT

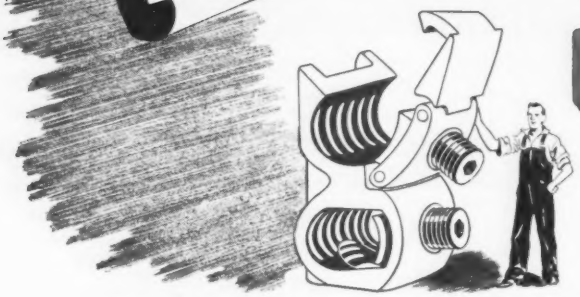
CIRTUBE EMT *Ask for it!*

ONE O.Z. FITTING DOES THE WORK OF 32

For Tee or Parallel Taps!



32 *connector sizes needed on this job!*



ONE *connector size is plenty with this XTP!*

One typical XTP connector replaces up to 32 different parallel or tee connectors because each XTP accommodates a wide range of wire sizes. All told, the XTP line of but 25 connectors will receive *over 400-wire size combinations!*

For either tee or parallel taps, just snap special hinged clamp over main and tighten the connector permanently in place—positive contact is assured. When you're ready to connect the tap, simply insert wire in tap end of connector. A wrench-turn or two, the job's done!

25 CONNECTOR SIZES do practically all tap jobs.
- Accommodate over 400 combinations of wire sizes
- Fit wire from #8 to 1,000,000 CM

HINGED CONSTRUCTION for quick installation.

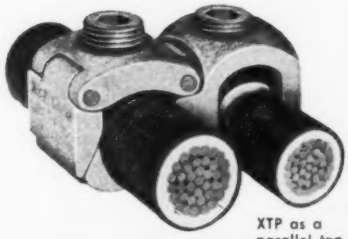
SPRING STEEL LOCK WASHERS (tin plated) maintain pressure.
- Hold resiliency—assure permanent connection

PRESSURE PLATES designed for maximum contact and grip.
- Serrated for firm grip
- Can not rotate during installation

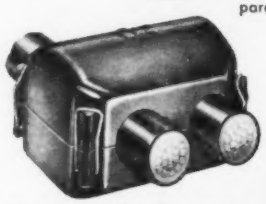
HIGH STRENGTH, HIGH CONDUCTIVITY.
- High conductivity copper alloy for body
- Extra strength copper alloy for pressure plates and hinged parts

Get these combination fittings from your wholesaler now... and put an end to bulky assortments of tap connectors.

XTP as a 'T' tap



XTP as a parallel tap



High-strength Bakelite insulating covers for XTP fittings. Compact, install with stainless spring clips, no taping.

They're O.K. if They're O.Z.

O.Z. ELECTRICAL MANUFACTURING CO., INC.

262 BOND STREET • BROOKLYN 17, N. Y.

- CAST IRON BOXES
- CABLE TERMINATORS
- POWER CONNECTORS
- SOLDERLESS CONNECTORS
- GROUNDING DEVICES
- CONDUIT FITTINGS
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UNIFORMITY

"VICTOR SUSPENSIONS—

**NOT ONLY LOOK ALIKE—
THEY PERFORM ALIKE,"**

*says Robert L. Perry,
Factory Manager,
Victor Insulators Division,
I-T-E Circuit Breaker Co.*

Why try to cut corners with suspensions whose mechanical and electrical characteristics may vary all over the lot? Be sure of uniformity with VICTOR Suspensions. They are made by the carload, year after year, yet each insulator is identical. Each has a built-in margin of safety that precludes failure on the line.

Big reason for this amazing uniformity is Purified Porcelain. This porcelain is denser, harder, stronger, has greater uniformity than any insulator porcelain ever made! Segregation and analysis of each shipment of raw material, scientific proportioning of ingredients, demineralization of all processing water and the use of densitizing pug mills make Purified Porcelain possible.

These processes together with quality-controlled manufacturing, and rigid, routine testing techniques make truly superior insulators. You just can't buy better suspensions—at any price!

I-T-E CIRCUIT BREAKER COMPANY
VICTOR INSULATORS DIVISION
Victor, New York

how to coordinate SMD Power Fuses for maximum protection

a case study using a new "step-by-step" technique

A common error in fusing the primary of a power transformer is the selection of a fuse of such a speed and ampere rating that the full protection capability of the modern fuse is not put to use.

Properly selected, a modern power fuse can provide for

1. system protection,
2. transformer protection against secondary faults, even line-to-ground,
3. use of transformer short-time daily overload capability,
4. use of transformer short-time emergency overload capability, and
5. complete and precise coordination with other overcurrent devices.

The selection of the right fuse, however, has not been easy, since there has been until now no commonly and consistently agreed upon method of coordination; and only meager information about fuse performance has been available.

Consequently, a new "step-by-step" method for power fuse coordination has been developed by S&C. Supported with all necessary power fuse performance data, this method utilizes the full protection capability of the *modern* power fuse; furthermore, it lends itself to general acceptance and universal use because its development was based on the realistic recognition of

1. the duties the user desires to impose today on a power fuse, and
2. the contradictions in power fuse selection work—the need for simplicity on the one hand and the need for precision on the other.

The case study which follows illustrates the new step-by-step method. It concerns the selection, specifically, of the proper SMD Fuse Unit for application on a power transformer primary.

• • • •

Case Data:

Transformer Bank:
7500 kva, 3-phase, self-cooled.
Primary voltage: 69 kv delta
Secondary voltage: 7.2/12.47 kv wye

Short Circuit Maximum:
Primary: 750,000 kva
Secondary: 80,000 kva (bus fault)

Secondary Breaker:
Ampere Rating: 1200
Reclosing Time: 10-40-100 sec.
Relay-breaker characteristic shown by curve, Figures D and G

Procedure:

Using the S&C Data Bulletin 262, open the front cover to the step-by-step outline shown in Fig. A.

Step 1: Select voltage rating of fuse to equal or to exceed line-to-line voltage of the system—69 kv.

Step 2: Check for adequate interrupting rating (Fig. B). Since the maximum available short-circuit is 750,000 kva, the correct fuse unit is SMD-2.

Step 3: Establish the minimum ampere rating of the fuse unit. In this case use the table for self-cooled or water-cooled power transformers (Fig. C). *(Similar tables are provided for forced-air-cooled power transformers and for potential and distribution transformers.)* The fuse unit ratings in this table have been selected to carry normal short-time daily overloads of the magnitudes established by ASA in the publication, "Guide for Loading Oil-Immersed Distribution Transformers and Power Transformers." No *additional* allowance need be made. Per Fig. C under the proper voltage (69 kv) and proper kva (7500), the correct fuse unit ampere rating is 100E.

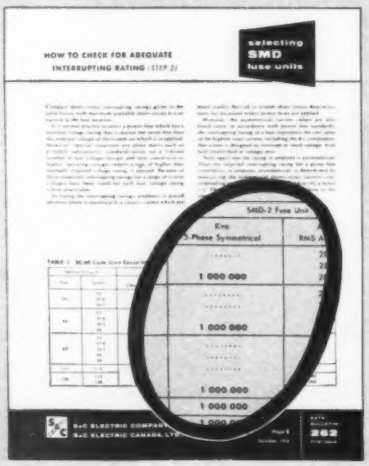
Step 4: Check coordination. Here are two ways: (1) Rule-of-Thumb Method (satisfactory in most cases) and (2) Precise Method (used when the Rule-of-Thumb Method apparently indicates that coordination is impossible).

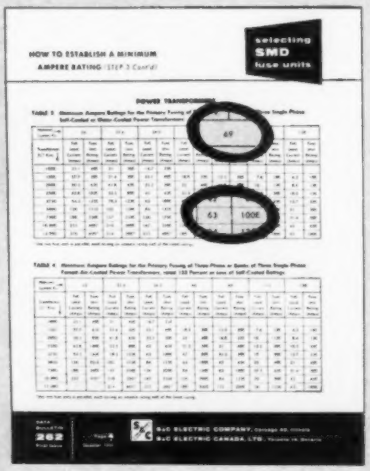
SECONDARY FAULTS—RULE-OF-THUMB METHOD, FIGURE D.

First: Establish the fault conditions under which coordination is to be checked and compute the fault current levels. In this example, a 3-phase secondary bus fault is assumed, resulting in a primary fault current of 680 amperes (see ① in Fig. D).

Second: At this fault current level, read from the time-current characteristic curve the minimum melting time for this fuse unit, 100E amperes—Standard Speed assumed. This gives Point ② in Fig. D 0.49 seconds.

Third: Multiply this time by .55—to give 0.27 seconds—thus establishing Point ③ a minimum margin between fuse and breaker-relay curves. The factor .55 makes allowances for variations in ambient temperature and for full pre-





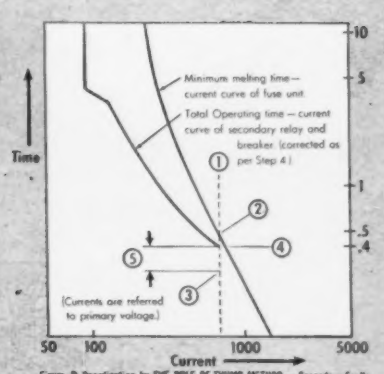
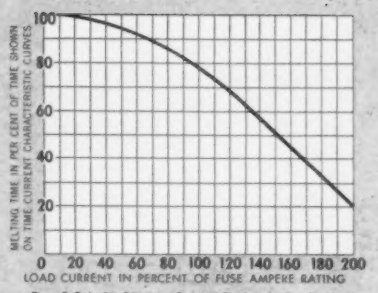


Figure D. Coordination by THE RULE-OF-THUMB METHOD — Secondary Faults


MELTING TIME IN PER CENT OF TIME SHOWN ON TIME CURRENT CHARACTERISTIC CURVES
100
80
60
40
20
0 20 40 60 80 100 120 140 160 180 200
LOAD CURRENT IN PERCENT OF FUSE AMPERE RATING
Figure E. Preloading Adjustment Factors—Standard and Slow Speeds

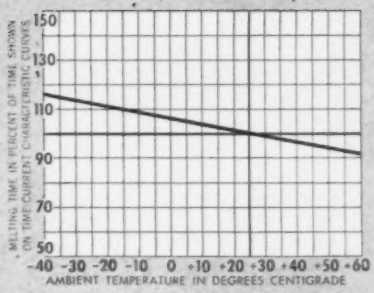


Figure F. Ambient Temperature Adjustment Factors

loading of the fuse, even from daily overloading of the transformer bank.

Fourth: Read from total operating time-current characteristic curve of secondary relay-and-breaker the operating time, Point ④ for this current level—0.40 seconds.

Conclusion: Coordination is not obtained since the time of Point ④ exceeds that of Point ③.

The next step is to recheck coordination, assuming a *Slow Speed* 100E ampere fuse unit. Here again, using the Rule-of-Thumb Method, coordination is not obtained. At this point, rather than to select a higher ampere rating which would sacrifice transformer protection, recheck coordination by the Precise Method.

SECONDARY FAULTS—PRECISE METHOD (an alternate to the Rule-of-Thumb Method), FIGURE G.

This method involves a comparison of the time-current characteristic curves of the selected fuse unit and the secondary breaker-and-relay *after both curves have been corrected* for the various factors that affect coordination. (See Fig. G below.) Factors for correcting relay and breaker curves are obtained from relay and breaker manufacturers.

The factors which apply to the fuse units are discussed below. They are:

- Adjustment for Preloading (see Fig. E above)
- Adjustment for Ambient Temperature (see Fig. F above)
- Allowance for the effect of cumulative heating and cooling of the fuse element during successive breaker operations (heating while short-circuit current flows, then cooling between breaker operations). Where the open-circuit time interval is less than ½ second, no allowance for cooling of the element is necessary; where the interval is 2 seconds or more (as it is in this case), the element will cool to a degree where cumulative heating need not be considered. (For intervals between ½ and 2 seconds, the full details on cooling time allowances are found in Data Bulletin 262.)

In this particular fusing problem, coordination with the secondary breaker-and-relay has been obtained by the Precise Method, since, in Fig. G, the time ② on the corrected fuse curve is greater than the total relay-breaker time ③ for this current level. This difference is indicated by ④. Were this not the case, using a Standard Speed Fuse unit, then a recheck would be made, using a fuse unit of the same ampere rating but Slow Speed. Do this rather than going to a higher ampere rating, since a higher rated fuse unit offers less protection to the transformer. If the Slow Speed does not coordinate satisfactorily, *then* recheck, using the next higher ampere rating in the Standard Speed.

PRIMARY FAULTS, FIGURE H.

For both Rule-of-Thumb and Precise Coordination Methods the same practice is used. No adjustments or margins are required. Coordination will be obtained where the total clearing time of the fuse unit ③ is equal to or less than the tripping time ② of the line breaker relay. ④ Indicates margin.

Step 5: Check for Short-Time Emergency Overload Operation.

These curves (Fig. I) show the ability of an SMD Fuse Unit to carry emergency overloads after carrying rated load. This overload situation arises, for example, when one transformer on a duplex substation is out of service for repairs or maintenance, putting the entire load on the other transformer and its fuses. The curves are based on an ambient of 30°C and represent the maximum *nonrepetitive* overload (in per cent of ampere rating) that an SMD Fuse Unit can carry for a given time without impairing its ability to perform properly. For each degree above or below 30°C, the capability may be adjusted 0.3 per cent.

• • • •

The above case study is a brief summary of a fusing problem solved by using the complete 12-page Data Bulletin 262 entitled, "Selecting SMD Fuse Units," published by S&C Electric Company. This bulletin with 8 Time-Current Characteristic Curves and a comprehensive text on coordination is yours for the asking.

S&C Electric Company, 4425 Ravenswood Avenue, Chicago 40, Ill. In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto, Ontario.

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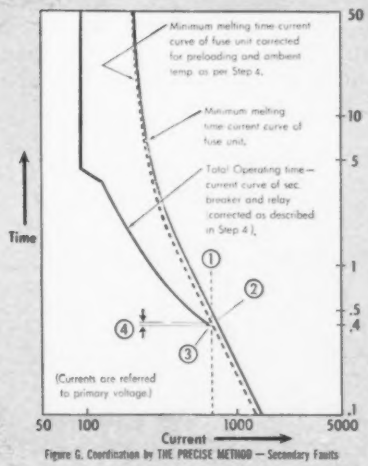

Figure G. Coordination by THE PRECISE METHOD — Secondary Faults

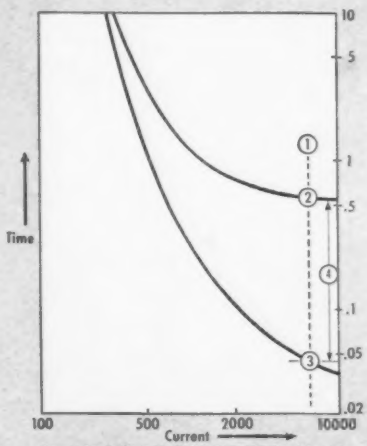

Figure H. Coordination by THE RULE-OF-THUMB METHOD — Primary Faults

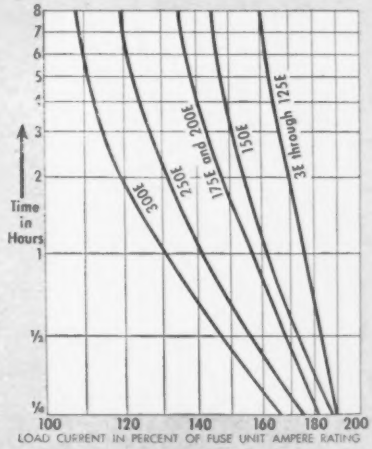

Figure I. Short Time Emergency Overload Capability—SMD-2 Fuse Units

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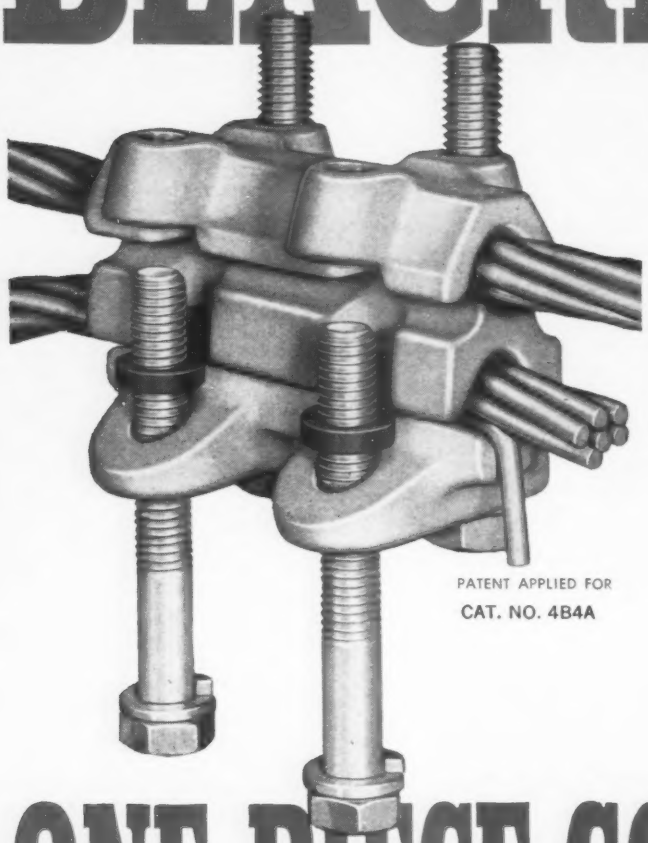


PATENT APPLIED FOR
CAT. NO. 4B4A

It's here... a heavy duty one-piece 4-bolt connector with all the electrical and mechanical advantages of a U-bolt connector... yet much easier to install.

No bothersome nuts, washers, housings, spacer to take apart and assemble. Just three quick, easy steps and installation is completed.

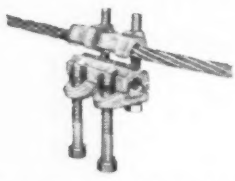
Housings are of non-copper-bearing aluminum alloy. Spacer of soft aluminum pig protects conductor, aids conductivity. Spacer treated with heavy coating of oxide inhibiting compound. Hardware is high strength aluminum alloy completely alumilited to prevent seizing.

WIDE RANGE..

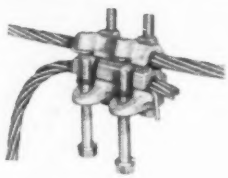
Accommodates conductors—2/0 to 397.5 ACSR—3/0 to 477 MCM

ONE-PIECE CONNECTOR

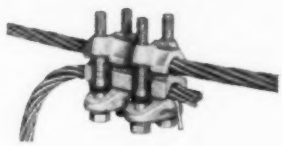
HERE'S HOW EASY THE NEW 4-BOLT CONNECTOR IS TO INSTALL



Unscrew the two free bolts contained with neoprene washers and hang over main.



Insert tap wire.



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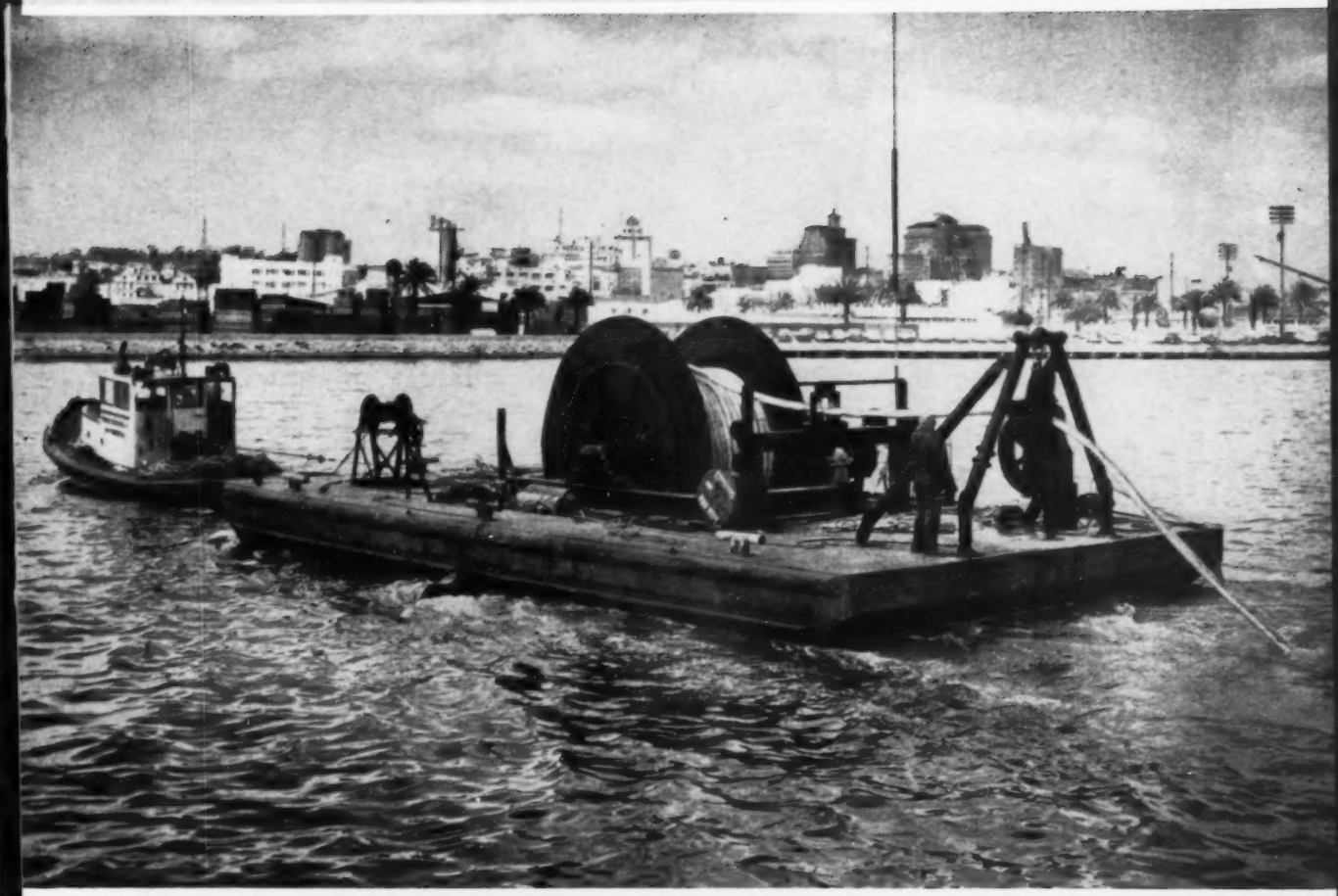


12kv giant goes under. San Diego Gas & Electric installed this 3,900-foot submarine cable across San Diego Bay in a fast and trouble-free operation. The new 12kv, 3/c, 500,000 CM cable is 4½ inches in diameter with Okolite rubber insulation, copper shielding tapes and steel armor.

Cable laying time: **half an hour flat!**

Okolite used for pre-tested dependability

The problem was to obtain maximum dependability in the new submarine cable laid under San Diego Bay to handle increased power needs in the busy Coronado area. In submarine cable, of course, dependability is doubly important with the rough service cable gets and the complicated and expensive operation required to lay a cable or remove it in case of trouble.

To insure this dependability, engineers from San Diego Gas and Electric chose pre-tested Okolite-insulated cable . . . and took advantage of three sound standards for evaluating anticipated cable service:

1. Time—High-voltage Okolite-insulated cables have a service record of more than 30 years . . . on land as well as in tough, underwater services, where a case of trouble can run into thousands of dollars.

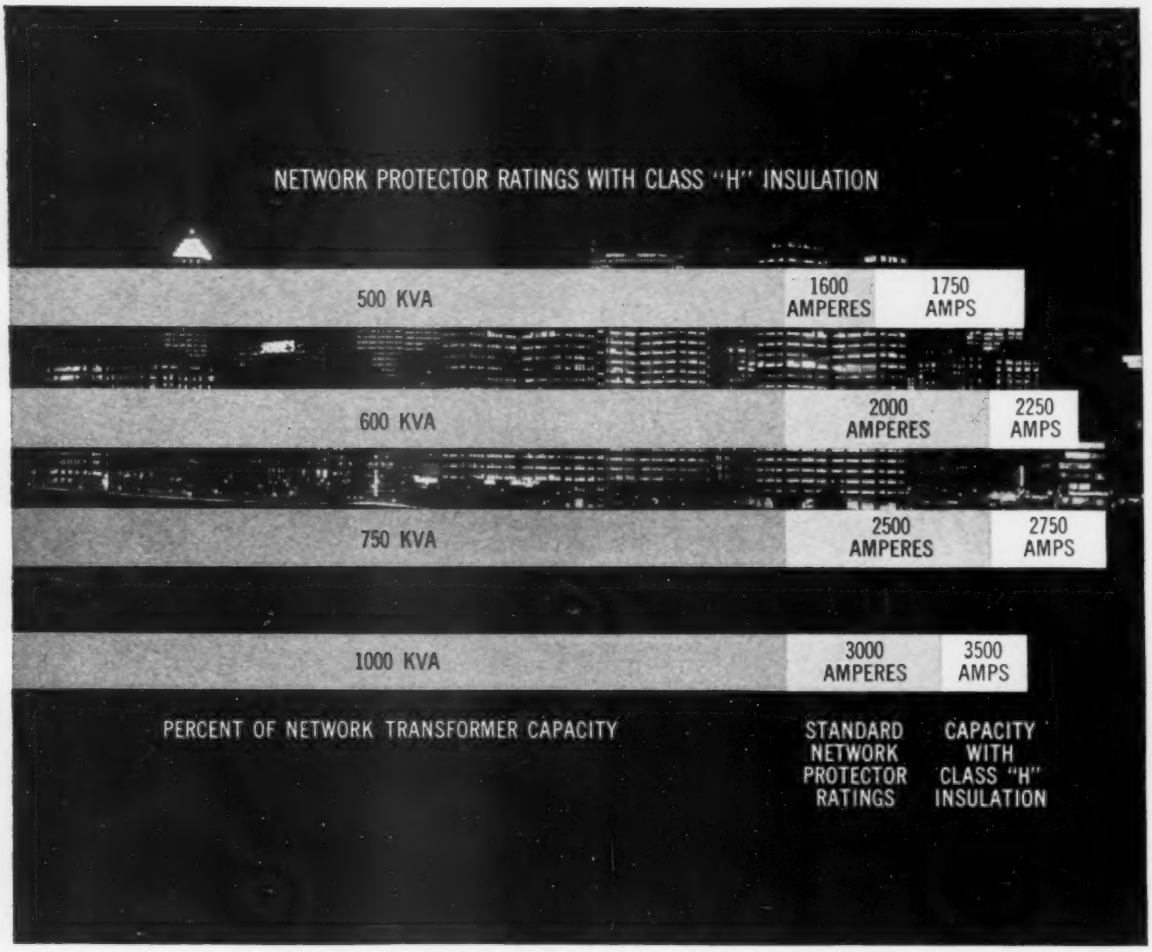
2. Engineering—Okonite engineers' know-how pays off in every stage of cable purchase and installation: from designing the best construction possible to speeding installation, as in San Diego's case, with Okonite-designed reel frames, lifting beams and other cable-handling equipment.

3. Inch-by-Inch Inspection—Okonite now provides built-in life insurance for every strip-insulated, high-voltage cable through the use of its exclusive development, the "Gooding Test Train." This electronic testing equipment, which scans every inch of the cable, can pick out the most minute imperfection—impossible to detect by any standard test method—that might shorten cable life after it's placed in service.

These are three good reasons for *you* to specify Okolite for *your* vital high-voltage circuits. Whatever your cable needs, when you talk to Okonite, you get unprejudiced recommendations because Okonite, and *only* Okonite, makes cable by all four insulating methods: strip . . . dip . . . extrusion . . . taping. The Okonite Company, Passaic, New Jersey.

where there's electrical power . . . there's **OKONITE CABLE**

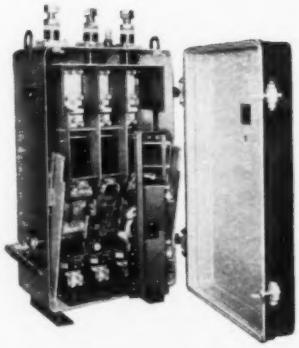
5479



Standard Network Transformer Ratings vs Standard Protector Ratings at 216 Volts (protector ratings shown with and without Class "H" insulation).

Westinghouse network protectors give you more capacity

Class "H" insulation extends protector ratings... another "Plowback of Earnings" bonus



Now, another improvement from Westinghouse research to help smooth over network system growing pains. Westinghouse Network Protectors have always provided a margin between maximum current rating of protectors and full-load current rating of network transformers. The addition of Class "H" insulation to protector relays and current transformers allows continuous operation at higher currents within temperature limits of the insulation.

Other exclusive features of Westinghouse Protectors contribute to simplicity and flexibility in system planning and operation. They now provide *more* capacity in the same space and reduce maintenance time and costs to a record low. Design and expand with Westinghouse Protectors — for the ability to handle present loads and the flexibility for *future* needs. Why not get all the facts? Contact your Westinghouse representative now or write to: Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania.

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- *EASY TO MOUNT*
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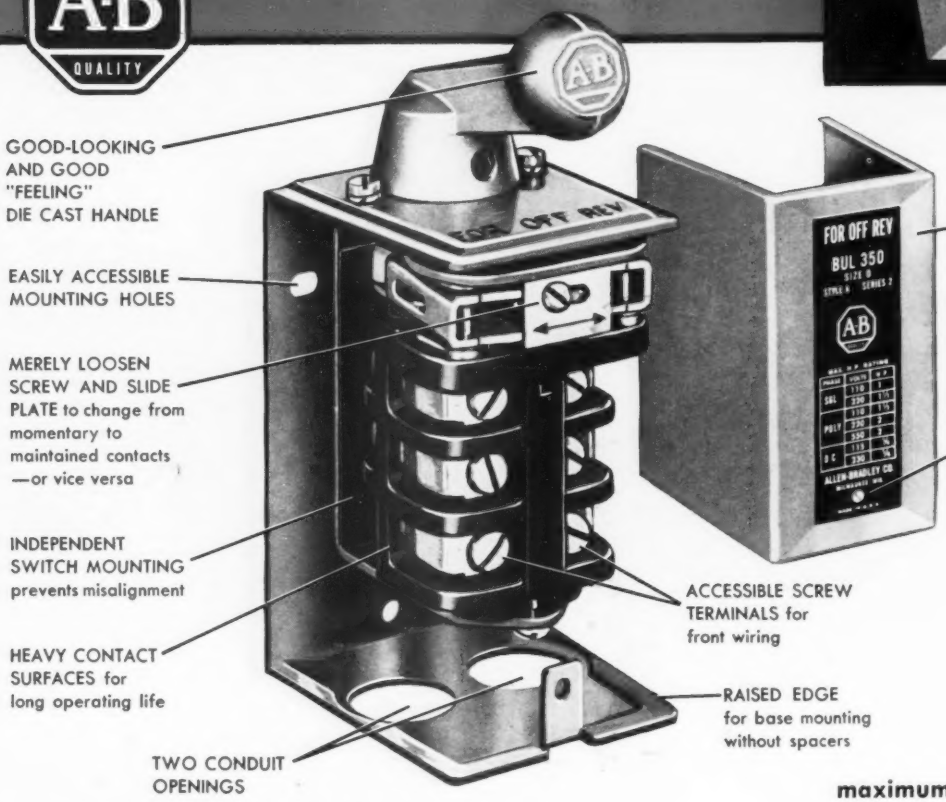
A new "quality" standard for small REVERSING DRUM SWITCHES



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INDEPENDENT SWITCH MOUNTING prevents misalignment

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WRAP-AROUND COVER gives complete access to drum

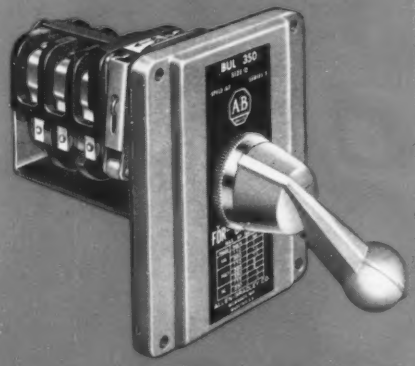
SINGLE SCREW COVER MOUNTING —screw cannot fall out

ACCESSIBLE SCREW TERMINALS for front wiring

RAISED EDGE for base mounting without spacers

maximum rating 2 horsepower

NEW OILTIGHT COVER PLATE FOR CAVITY MOUNTING



Bulletin 350 Reversing Switch can be furnished with oiltight cover plate with rubber gasket seal for cavity mounting in a machine base.

This *all-new* Allen-Bradley reversing drum switch was designed to keep pace with the mechanical beauty designed into so many of the modern machine tools.

The Bulletin 350 reversing switch is equivalent to a three-pole, double throw switch . . . and can be used with d-c motors; or single phase, two phase, or three phase a-c motors.

Investigate the Bulletin 350 . . . the *new leader* of its class . . . in appearance, ease of installation, and operating life. An Allen-Bradley *quality* switch . . . in every sense of the word. Send for descriptive bulletin.

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6-58-MR

THE PEACEFUL ATOM

...can propel a ship one year without refueling

New Study Shows Nuclear Power May Be Practical and Economic for Merchant Ships

Some gray dawn in the early 1960's a heavily laden supertanker will shoulder her way through the steep Atlantic swells to a landfall in Delaware Bay. She'll be homeward bound for Philadelphia, 19 days out of Kuwait with nearly 40,000 tons of oil.

FOR SHIPS LIKE THIS...

No more dependent on thousands of tons of payload-stealing fuel oil, tomorrow's ships will range world-wide trade routes without refueling.

In the last twelve months she will have made eight trips to the Persian Gulf hand running. Now at last she is due for her annual refit... *and her annual refueling.*

Competitive at sea

A nuclear power plant for a ship of this type was the subject of a study recently completed by Atomics International for the Maritime Reactors Branch of the Atomic Energy Commission. Costs of building and operating a vessel powered by an Organic Moderated Reactor were compared with those for an oil-burning ship—a typical modern supertanker of some 38,000 deadweight tons.

Total costs for the OMR tanker, depreciated over 20 years, were only moderately higher than for today's conventional ship. But costs for oil-burners are on their way up, with steadily rising fuel prices seen from now on—whereas the cost trend for the OMR is downward, as nuclear technology is improved. An OMR tanker has greater cargo capacity because its fuel takes up little space. And it needs refueling less than once a year.

Bigger payloads, longer hauls, faster turn-arounds—this is the new pattern of operation. Shipowners can begin plans right now, for the Organic Moderated Reactor promises to put the atomic merchant ship on a sound commercial basis.

Versatile on land

The same features that make the OMR applicable for seagoing use are also in its favor for central power stations ashore. The basic simplicity and safety of this system point to economic nuclear electricity for many areas of the world today.

Plans are already underway to build an OMR plant in Piqua, Ohio, which will increase the city's electrical generating capacity by 12,500 kilowatts. Another OMR power station is planned for a Latin American country.

First OMR now in operation

All this stems from the results being achieved with the Organic Moderated Reactor Experiment, conducted by Atomics International for the Atomic Energy Commission. The Organic Moderated Reactor Experiment is being carried on at the AEC's National Reactor Testing Station in Idaho to establish the basic engineering data for this type plant. Atomics International is also operating the Sodium Reactor Experiment, a nuclear power project for the AEC. Another power reactor concept, the Advanced Epithermal Thorium Reactor, is under study for the Southwest Atomic Energy Associates. AI research reactors are now operating in Japan, Germany, Denmark, and the United States. Another is being built for Italy. ATOMICS INTERNATIONAL, P.O. Box 309, Canoga Park, Calif. Cable address: ATOMICS.

...ATOMIC ENGINES LIKE THIS

Al's Dr. A. B. Martin shows on this OMR tanker model how the compact power plant will free thousands of cubic feet of fuel space for revenue-producing cargo.

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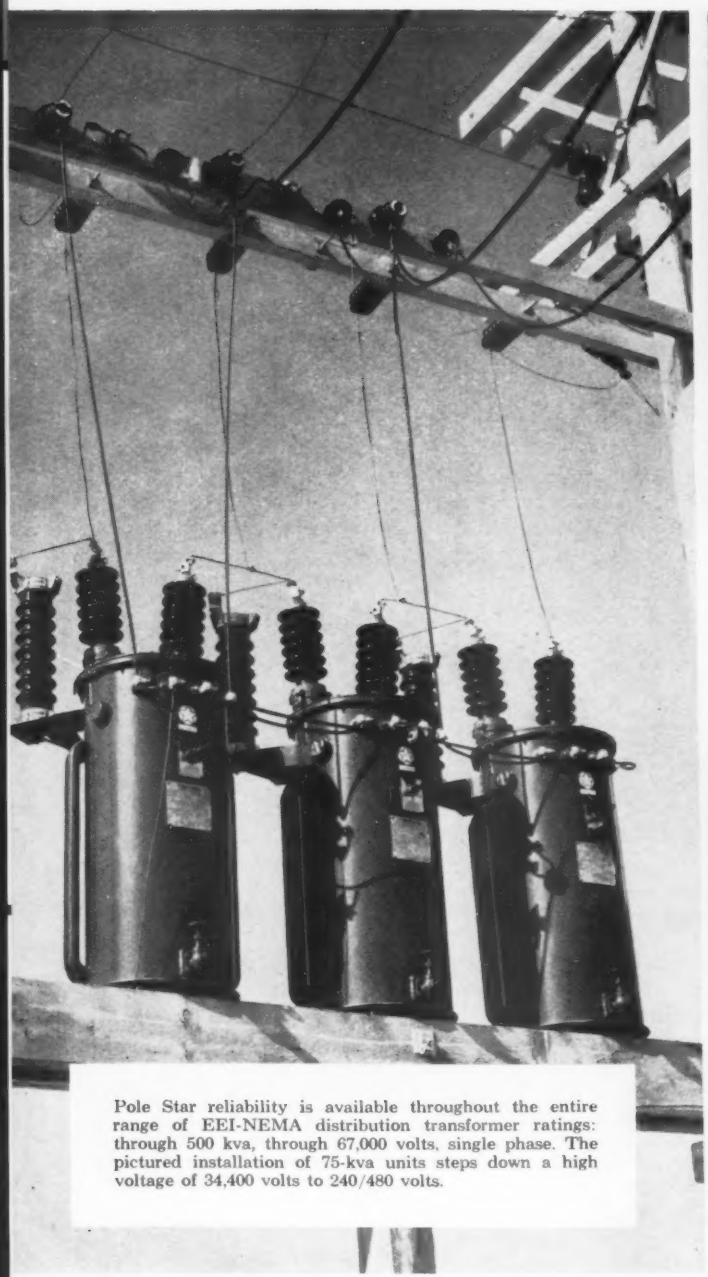
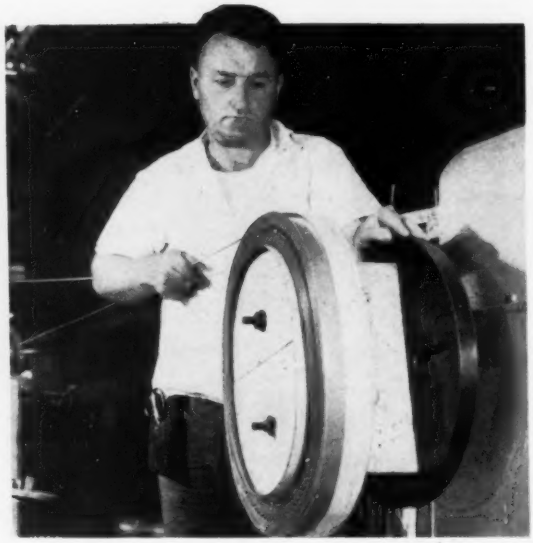
PIONEERS IN THE CREATIVE USE OF THE ATOM

Electrically, Mechanically... POLE STAR

the ruggedness that's needed

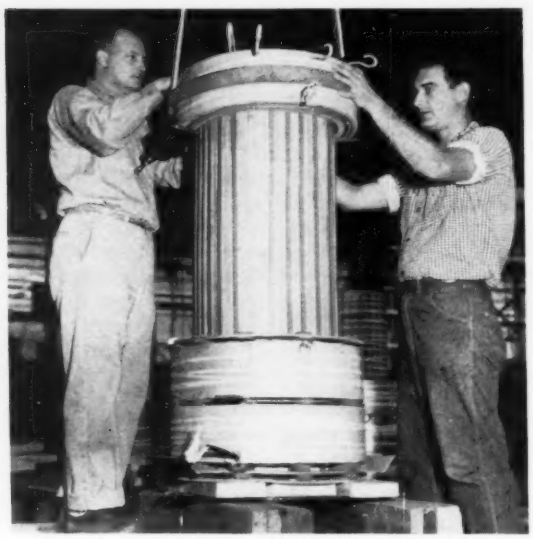


Pole Star reliability is available throughout the entire range of EEI-NEMA distribution transformer ratings: through 500 kva, through 67,000 volts, single phase. The pictured installation of 75-kva units steps down a high voltage of 34,400 volts to 240/480 volts.



Above: Sections of Pole Star high voltage coils are wound on precise molds to assure uniform dimensions. Maintenance of proper tension on the wire, plus the use of thin layer insulation, produces coil sections that are completely firm, without "sponginess."

Below: High voltage coil sections are snugly fitted over the layer-wound low voltage coil. A free flow of oil for cooling is assured by the liberal use of spacers—between the high voltage sections as well as between the high and low voltage coils.



POLE STAR

PENNSYLVANIA POLE STAR

SECTIONAL COILS have for high voltage applications

To obtain uniform distribution of voltage stresses throughout the winding is one of the principal reasons for using sectional high voltage coils in Pole Star distribution transformers rated 34.5 kv and higher. In addition to providing this basic advantage—which results in high resistance to lightning and other voltage surges of impulse magnitude—Pole Star sectional coils feature several Pennsylvania Transformer developments that play an important part in the *sustained performance* of Pole Stars under the most rigorous conditions.

Pole Star Bonding Process Provides Exceptional Strength

Like all Pole Star coils, high voltage sections are wound on precise molds to assure uniform dimensions. By carefully maintaining proper tension on the wire during the winding process, and by taking full advantage of the thinner layer insulation made possible by the Pole Star design, Pennsylvania Transformer craftsmen produce coil sections that are completely firm, with no "sponginess."

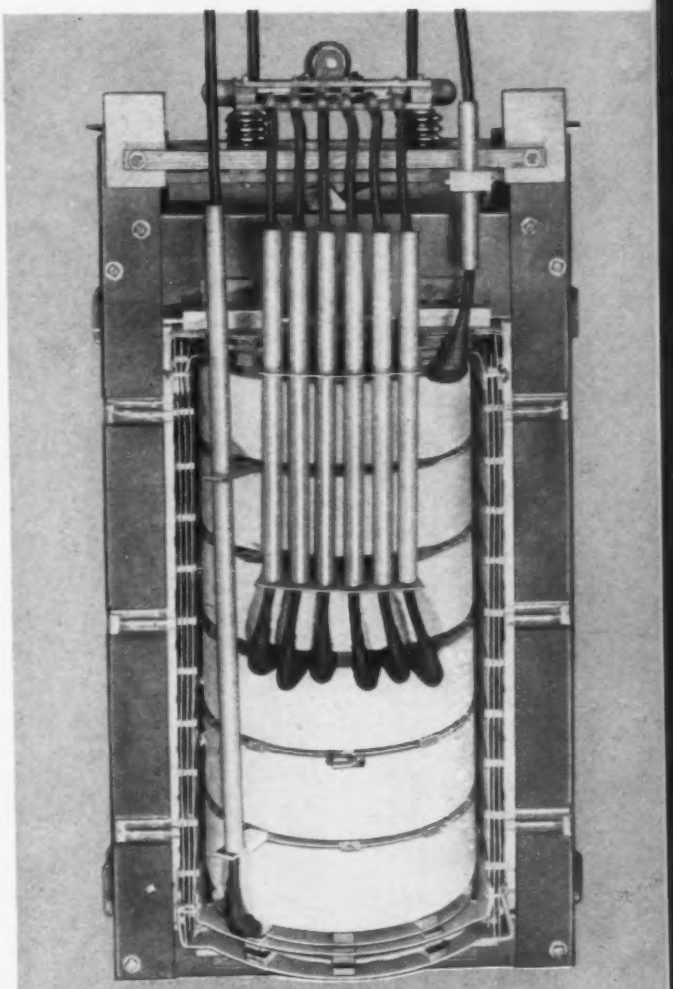
After high voltage sections are snugly fitted over the layer-wound low voltage windings, the completed coil undergoes a curing and drying cycle that firmly bonds each turn of wire to the adjacent insulation, by first softening and then polymerizing a special adhesive with which the kraft layer insulation is pre-coated. This procedure produces a coil with exceptional resistance to short circuit . . . and also assures high electrical strength by retaining the pliability of insulation and permitting the penetration of oil throughout the coil.

Crepe Insulating Collars Give Extra Margin of Protection

A primary reason for the compactness of Pole Star high voltage sectional coils—and for the space-saving, weight-saving transformers they make possible—is the efficient use of the best available insulating materials. For example, the crepe paper used with kraft insulation is folded over at the ends of the coil. This creates an insulating "collar" that achieves maximum electrical strength without adding unnecessarily to coil size. The additional puncture strength and creepage path this collar provides help create an impulse strength that liberally exceeds ASA-NEMA standard impulse levels.

These features and advantages all add up to the *ruggedness* that is needed for high voltage distribution transformer installations. For more Pole Star facts—or for a quotation on specific units—contact Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pa.

McGRAW EDISON



The internal ruggedness of high voltage Pole Stars is achieved by combining sectional coils with other outstanding features. The core-and-coil assembly is supported by a sturdy, pressed steel, angle-and-channel frame. Maple braces above and below the coil give added protection against possible short circuit forces. High voltage leads are insulated in pressboard tubing and held firmly in position by supports that are an integral part of the coil.

DISTRIBUTION TRANSFORMERS

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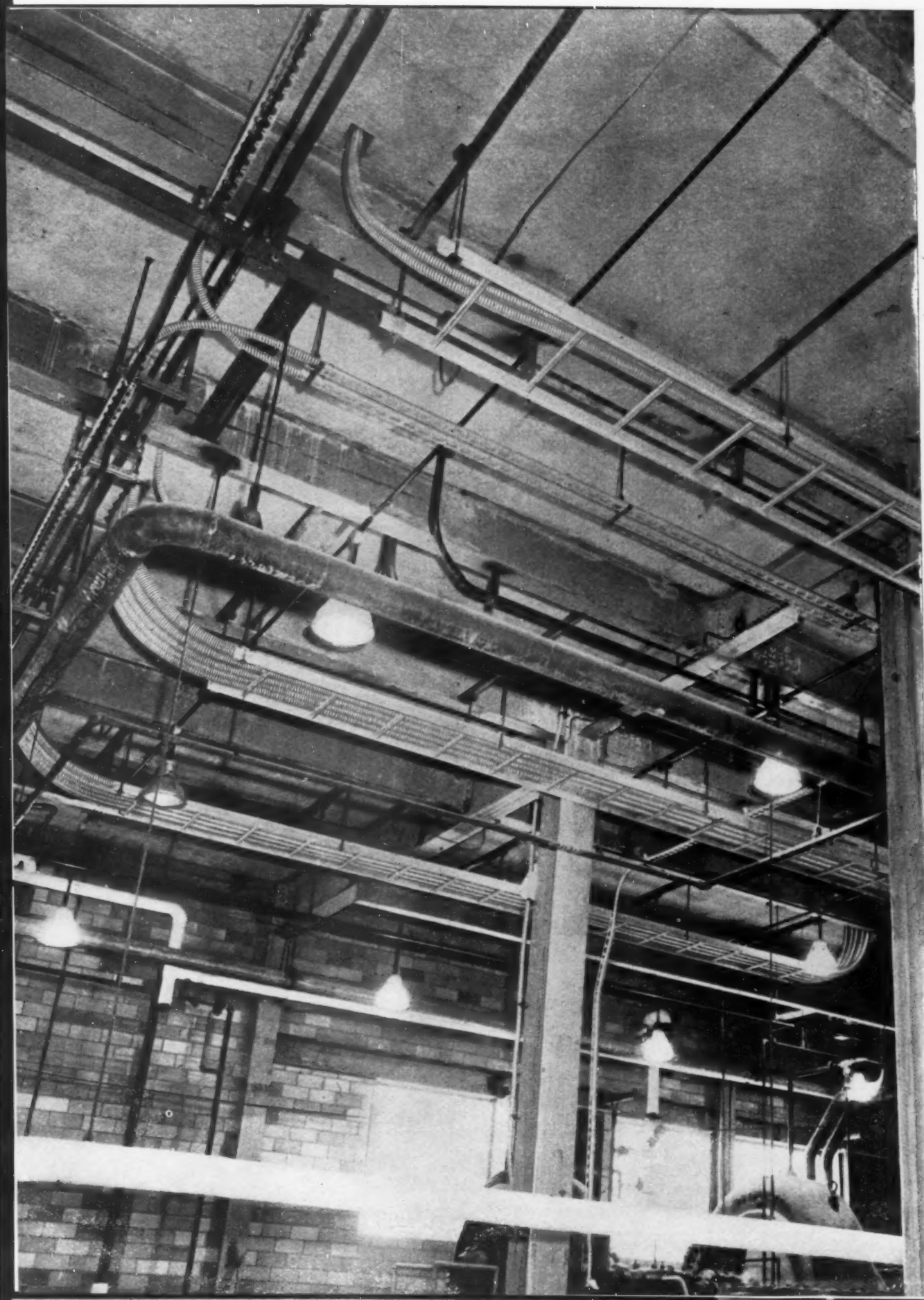

this picture shows why . . .

Anaconda's Duralox Cable cuts installation costs for Electric Utilities

Duralox needs no conduit—saves time, money, man power . . . provides greater safety!

Duralox* is enclosed in its own durable, yet flexible metal armor. Thus, it can be installed *without* conduit—in long runs over and around obstructions, in racks, indoors or out. For one midwest utility this meant a savings of $5.00 per foot—over the cost of installing ordinary cable with rigid conduit!

Duralox is so flexible that additional flexible connections are not needed at motors. Duralox is easily moved—allowing for changes in design during construction or service, and facilitating repair work on other apparatus.

Because cables are always shielded, Duralox means greater safety.

And Duralox's lower reactance in higher voltages—from the close spacing of conductors—results in reduced voltage drop and more efficient power distribution. Anaconda Duralox Cable is available in all popular sizes and voltages—copper or aluminum conductors with paper, rubber, plastic or varnished-cloth insulation. Anaconda Duralox is also available for control circuits.

Why not talk to the Man from Anaconda about Duralox for your utility operation. See Anaconda in your telephone directory, in most principal cities.

FITTING NEATLY AROUND OBSTRUCTIONS. Anaconda Duralox Cable meant easy installation in utility's generating station.

BULLETIN DM5606 on Anaconda Duralox is yours for the asking. Write: Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

*Reg. U.S. Pat. Off. 58307

OUTSIDE RUNS of weather-resistant Duralox are supported by simple extensions of racks. Since Duralox can be used inside or out, number of joints is kept to a minimum.

FASTEST WESTERN SERVICE — At Orange, California, Anaconda's expanded, modernized mill fabricates and stocks copper and aluminum wire and cable for *every type of application*. Anaconda assures the fastest possible service on all West Coast needs. See Anaconda Sales Offices: Los Angeles, San Francisco, Seattle, Denver. 58307

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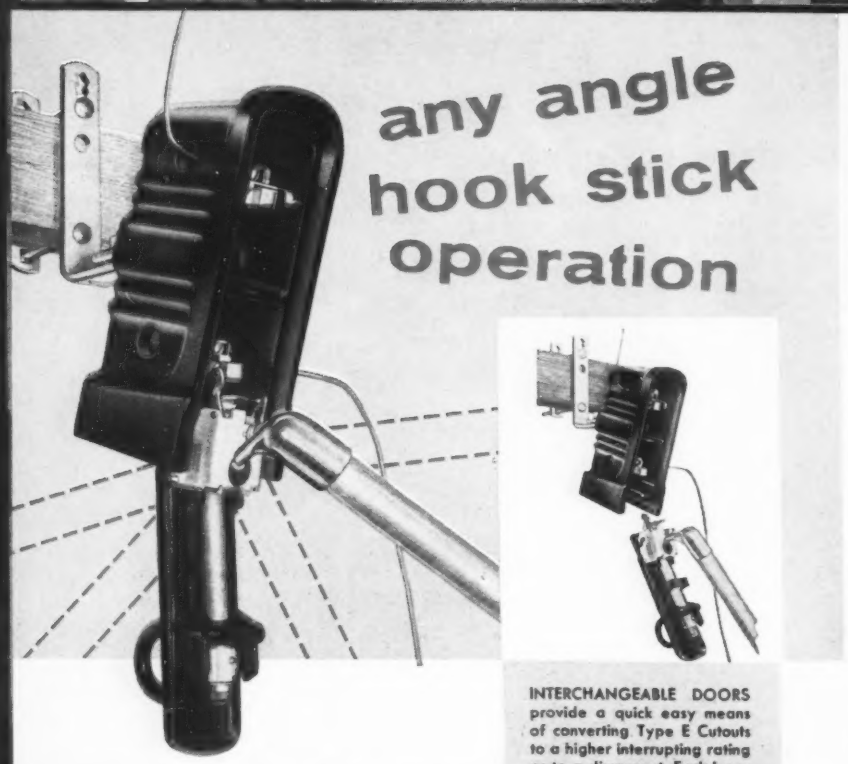
SEE THE MAN FROM

ANACONDA®

FOR **DURALOX POWER & CONTROL CABLE**



INTERCHANGEABLE DOORS provide a quick easy means of converting Type E Cutouts to a higher interrupting rating or to a disconnect. Each housing will accommodate three different door assemblies.

NEW CHANCE 10,000 AMP CUTOUT

new ease of operation... interchangeable ratings... resiliency to resist shock

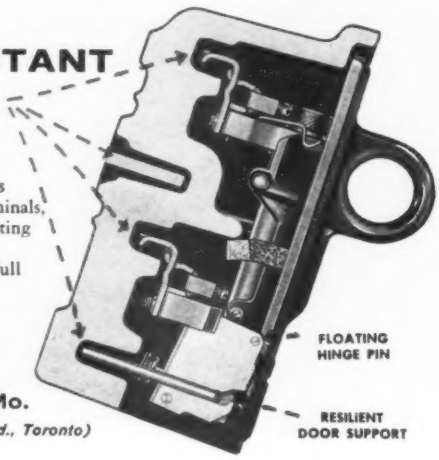
These new porcelain enclosed cutouts cover the complete range of NEMA ratings in 50 and 100 amp cutouts, and 100 and 200 amp disconnects. Rated 5.2 and 7.8 KV, they have interrupting capacities from 2,000 to 10,000 amps.

Special socket inside the door permits doors to be completely installed and removed from any angle or position with a standard hook stick—an *important feature to operating men.*

The "E" Cutout can be used as a flag indicating cutout with the built-in drop-down flag that signals an outage, or as a full 180° dropout cutout that permits easy removal of door with a hook stick.

SHOCK RESISTANT EPOXY RESIN MOUNTING

The use of epoxy resin mountings gives strength and resiliency to contacts, terminals, trunnion, and mounting hanger. A floating hinge pin and mounting of the door assembly on a resilient trunnion gives full protection against door breakage. Ribbed housing provides high dielectric strength.



A. B. CHANCE CO.

General Offices: Centralia, Mo.

(A. B. Chance Company of Canada, Ltd., Toronto)

CK58-7

ELECTRICAL BOOKS

ELECTRICITY AND MAGNETISM, 613 *pages*, 6x9, *by J. Newton, Philosophical Library*, $10.

This book starts with a study of current electricity apart from two introductory chapters on electrostatics and magnetism. This order of treatment leads to a more balanced and interesting approach to the subject without making any sacrifice in the logical development. Many fundamental but often abstract concepts that are met within a study of electricity are fully explained.

NATIONAL ELECTRICAL CODE HANDBOOK, *9th edition*, 650 *pages*, 5½x8, *revised by Charles L. Smith, McGraw-Hill Book Co.*, $8.

Arthur Abbott's standard handbook is brought forth in its ninth edition to conform to the 1956 edition of the National Electrical Code. It was revised by the late Charles L. Smith, the secretary of the National Fire Protection Assn., and is sponsored by the latter. It reflects the almost 200 changes made in the 1956 code; it follows the exact numbering system used in the code, giving explanations and illustrations to explain what these rules mean.

INTRODUCTION TO ELECTRICAL ENGINEERING, 466 *pages*, 6x9, *by George F. Mueller, McGraw-Hill Book Co.*, $7.50.

This book presents the fundamental principles of electric and magnetic circuits and fields. The material is arranged so that the first eight chapters include the necessary topics for a one-semester course and the remaining chapters are suitable for a subsequent course or as reference material. In this third edition the order of presentation has been changed to conform with the suggestions of users of previous editions. New material includes: tetrodes, pentodes, cathode-ray tubes, photoelectric tubes, transistors, magnetic amplifiers and magnetrostriction.

BASIC ELECTRICAL ENGINEERING, 540 *pages*, 6x9, *by A. E. Fitzgerald and David E. Higginbotham, McGraw-Hill Book Co.*, $7.50.

Stressing the scientific, analytical and physical background of modern electrical engineering, this text recognizes the importance of electronics, measurements and control in all branches of engineering. It presents an integrated and comprehensive introduction to these fields as well as the power and machinery fields. This is the second edition, and new concepts are introduced in a more gradual manner with fuller explanations.

PRACTICAL ELECTRICAL WIRING, 602 *pages*, 6x9, *by H. P. Richter, McGraw-Hill Book Co.*, $6.75.

This fifth edition, based on the 1956 National Electrical Code, has practical methods of electrical wiring explained in plain, easy language for the man who does the work. It tells how to do all kinds of light and power wiring jobs in the home, farm and factory markets. The basic principles behind the methods are explained.

THE LINE WITH THE GOLDEN TOUCH

Residential Outdoor Surface Meter Socket

Residential Flush Meter Trough

Residential Indoor Surface Meter Socket

A COMPLETE LINE OF HEAVY DUTY METER MOUNTING DEVICES

What we mean by The Line With The Golden Touch

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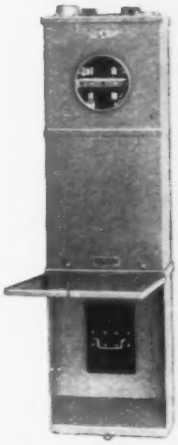
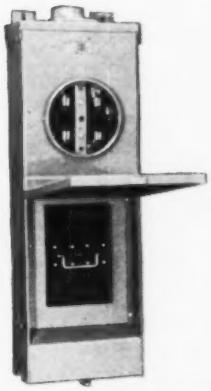


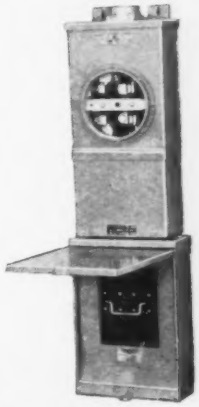
Commercial Outdoor Surface Safety Socket With Fusable Disconnect



Residential Outdoor Surface Pullout

Commercial Outdoor Surface Manual Circuit Closing

Commercial Flush Safety Socket



Commercial Outdoor Surface Manual Circuit Closing With Fusable Disconnect

Watch for opening of new offices in San Francisco, Portland, Phoenix, and Honolulu

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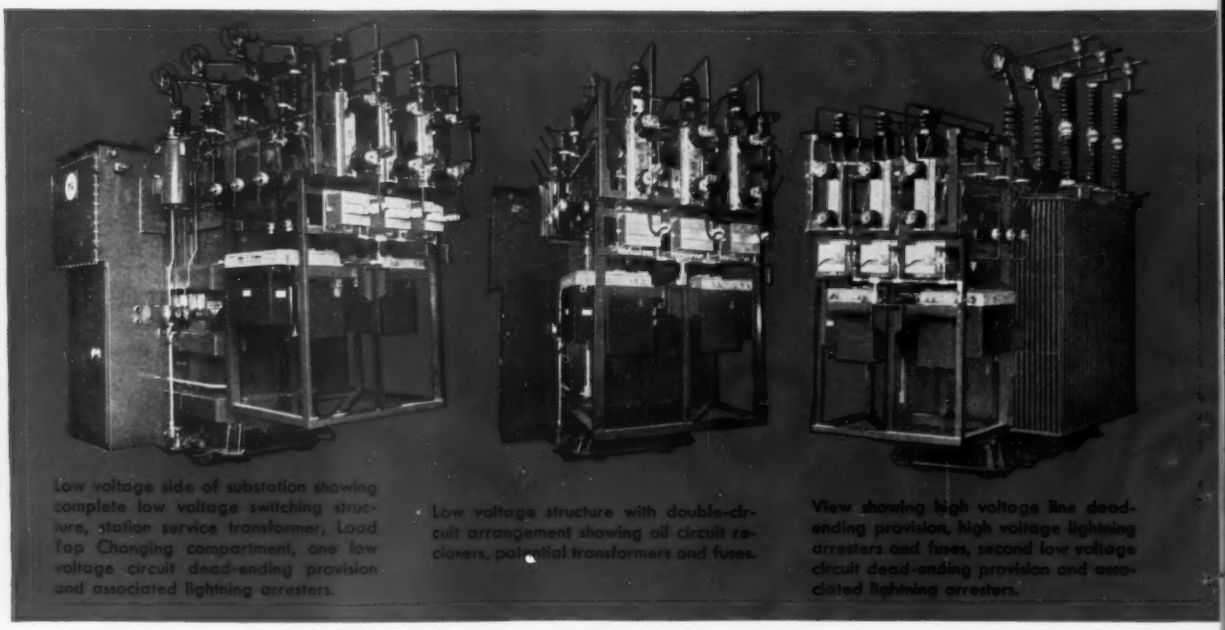
A JOINT VENTURE THAT LED TO A NEW DEVELOPMENT IN SUBSTATION CONSTRUCTION

Double-Circuit Integrated Substation . . . An efficient, economical means of serving outlying areas, developed through the combined efforts of Public Service Company of Indiana, Inc., and Moloney Electric Company.

The recent shipment of this unit, which is the first of this type to be built, is the climax of many design conferences between representatives of the two companies.

The Double-Circuit Integrated Substation is an outstanding example of how user and manufacturer may work together to develop the new products necessary to solve the increasingly difficult problem of providing economical yet dependable service to the utilities' customers.

The ability and the facilities of Moloney Electric Company stand ready to assist you in the solution of your transformer problems.



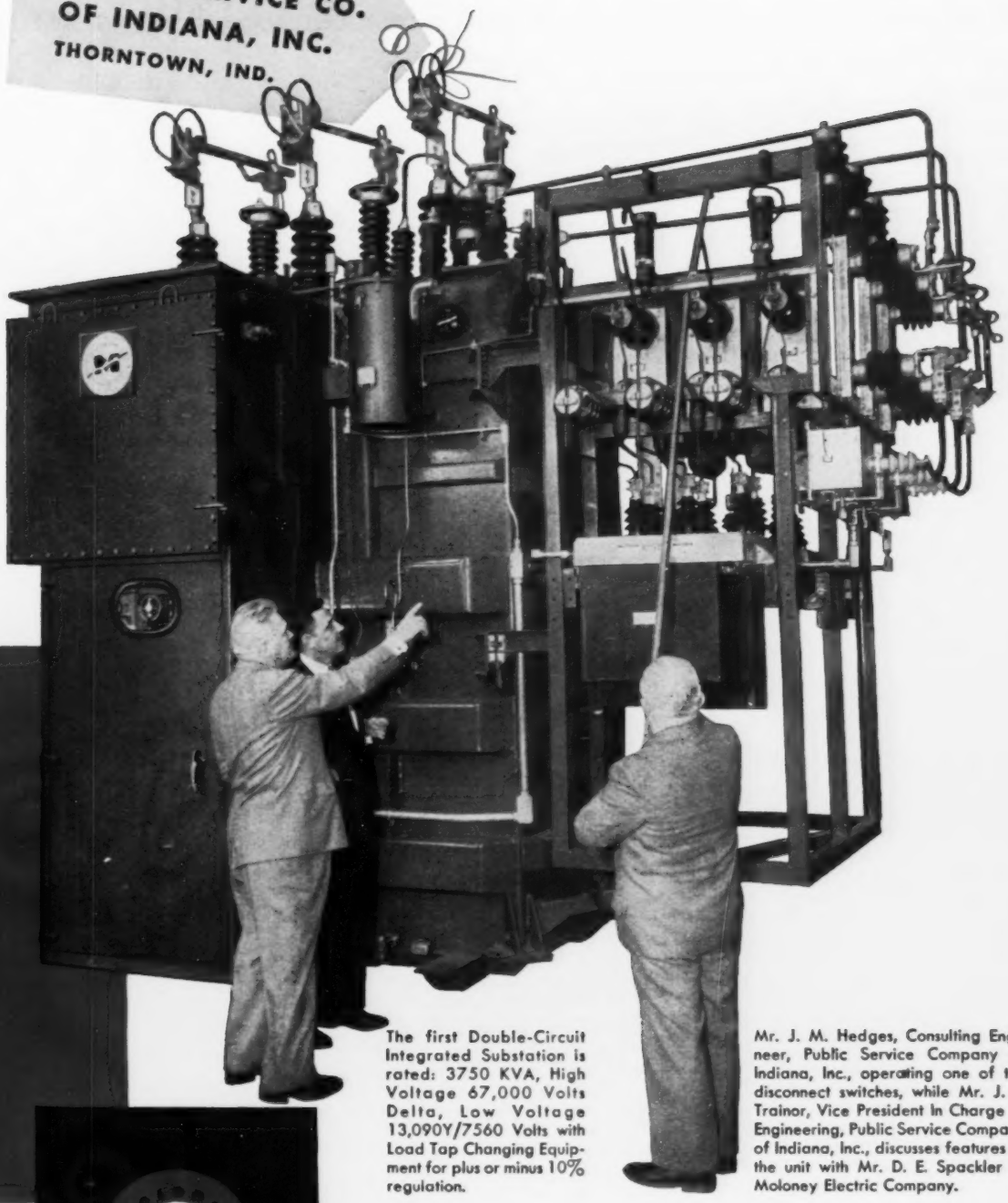
Low voltage side of substation showing complete low voltage switching structure, station service transformer, Load Tap Changing compartment, one low voltage circuit dead-ending provision and associated lightning arresters.

Low voltage structure with double-circuit arrangement showing oil circuit reclosers, potential transformers and fuses.

View showing high voltage line dead-ending provision, high voltage lightning arresters and fuses, second low voltage circuit dead-ending provision and associated lightning arresters.

MOLONEY ELECTRIC COMPANY

For:
PUBLIC SERVICE CO. OF INDIANA, INC.
THORNTOWN, IND.



The first Double-Circuit Integrated Substation is rated: 3750 KVA, High Voltage 67,000 Volts Delta, Low Voltage 13,090Y/7560 Volts with Load Tap Changing Equipment for plus or minus 10% regulation.

Mr. J. M. Hedges, Consulting Engineer, Public Service Company of Indiana, Inc., operating one of the disconnect switches, while Mr. J. J. Trainor, Vice President In Charge of Engineering, Public Service Company of Indiana, Inc., discusses features of the unit with Mr. D. E. Spackler of Moloney Electric Company.

Manufacturers of Transformers for Utilities, Industry, and Electronic Applications

FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA
SALES OFFICES IN ALL PRINCIPAL CITIES

ELECTRA'S HUSBAND

Take A Tip...

ELECTRA swished into the room, and began stripping off her gloves. I did a double take at her outfit, which was one of those chemise contraptions with the belt line around the knees.

"Get that silly expression off your face," she grinned, "this is supposed to be very chic."

"You actually didn't wear that out in public, did you?"

"I most certainly did, and the girls at the Garden Club were green with envy."

"I can see where they might be green, all right," I retorted. "But what I can't understand is how you so-called mature, intelligent women allow yourselves to be dictated to fashionwise by some of those panty-waists in Paris or Rome or wherever else it is they dream up those monstrosities."

"Oh, quit raving," said Electra. "You are just jealous because you husbands don't know how to get women to follow *your* ideas. Mix up a martini for us, and I'll tell you the secret."

As I measured out the vermouth, Electra continued, half seriously: "Over here in the good old U. S. A. the big appeal is to make life easier for women; over in Europe they concentrate more on making us easier on the eyes. Here, the appeal is to our laziness; over there, it is to our vanity—and which do you think is the most popular approach?"

"If you think that outfit does anything for you," I protested, "I'll—"

"Now I'll admit," Electra interrupted, "that the new styles sometimes get way out in left field. But they're still stylish and you, who pride yourself on being such a hot businessman, should be the first one to admit that discarding the old and adopting the new is good business."

"Well, the dress designers, manufacturers and textile people do have a pretty good thing," I admitted. "It would be right nice for the industry if we could get you housewives to throw out all your appliances every year or so and start all over again. I hate to think what it would do to the bankroll though."

"Well," said Electra, "it might not be practical to throw out all of our appliances periodically, but it seems to me that you men should be smart enough to figure out some way to take a tip from the couturiers and get some style changes in at least part of your sales pitch. Say, this martini is giving me an idea. I think I know one way you could appeal to our style consciousness."

"What's that?" I asked suspiciously, well aware that Electra could ride an idea to the point of exasperation.

"Well, there's one place that you could work for style changes every year." Electra was being smug. "In fact, the electrical industry is already doing it quite successfully in many places."

"Elucidate," I commanded. "I just don't know what you're referring to."

"All right, I will." Electra was beginning to wax enthusiastic. "How about all these outdoor Christmas lighting campaigns that make a neighborhood so much more attractive during the holiday season? Wasn't the idea of contests for the best outdoor Christmas decorations started out here in the West? And doesn't the contest make families think about changing their decorations each year, making them more elaborate and more attractive?"

"That's true," I admitted, "and it does make the neighborhoods more attractive, and to some extent focuses attention on the electrical business. Businesswise it represents the sale of a few more strings of Christmas tree lights and some extra kilowatt-hours. But we need something a lot bigger than that to really capitalize on your feminine weakness for change."

"I'm coming to that. What would happen if you got the same kind of response with garden lighting contests all over the West that you do with the Christmas lighting contests? We women are about as proud of our gardens as we are of our figures. It seems to me that the electrical industry could make a very strong appeal to the women if it would get us thinking on how we could make our gardens the 'talk of the town.' It should appeal to your commercial instincts too, because garden lighting lasts all summer and well into the fall."

"There's another angle to it, too! I suppose you would have to get a contractor to put in some permanent outlets around the yard and maybe even some of those special lights. But think how easy it would be to use the same things at Christmas time.

"I'm beginning to think that a modern house should have yard outlets just as well as lots of them inside. You wouldn't always want to use them for lighting. Look in any of the home magazines and you'll see more and more electric gadgets for working in the garden. There's an electric hoe, sprayers and all sorts of gadgets that would be real useful if you didn't have to run miles of cord.

"You know, Electra, that's not a bad idea," I conceded. "There's some real potential there. It might take quite a bit of doing to get it started, but if it could be put across it would make a very nice contribution to better living—electrically. As a matter of fact, I've been thinking for some time that we ought to do something along those lines with our garden."

"So have I," said Electra. "and there was quite a bit of discussion today at the Garden Club about such things. It seems that most people just don't know how to start and don't know where to get the things that make up a garden lighting installation. Maybe some of your big associations like the PCEA and NELPA could get behind a program and offer some prizes. It's got to be done on a big scale if you're going to get the women fired up and in competition with each other."

"I think you have something there," I admitted. "And speaking of competition, that dress of yours ought to win some sort of a prize for an extreme in fashion."

"See, I told you so," gloated Electra, "this dress has served its purpose because it made you notice me. But you won't think it's so funny when you get the bill."

Craftsmanship at Allis-Chalmers

Skilled Hands build long life and outstanding performance into Allis-Chalmers distribution transformers

Start with advanced research and development. Set high standards in design, engineering and manufacture. Work with only the best materials and facilities. Crown your efforts with industry's most rigid quality control program. Give these ingredients to master-craftsmen. This is what Allis-Chalmers does to build long life and top performance into a transformer.

At Allis-Chalmers, craftsmanship penetrates every operation—from the laboratory to the shipping platform. It's your assurance of always getting the maximum transformer value.

For the complete craftsmanship story, see your Allis-Chalmers representative or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

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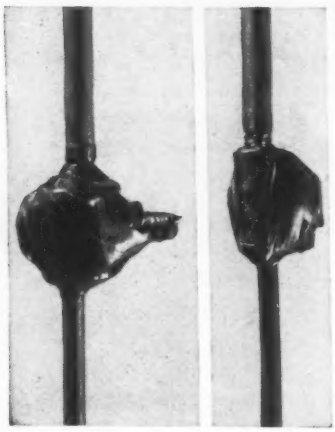
A-5486

New Alcoa 390-490 Series Extruded Parallel-Groove Clamps are More Compact, Easier to Apply



COMPETITIVE CLAMP ALCOA CLAMP

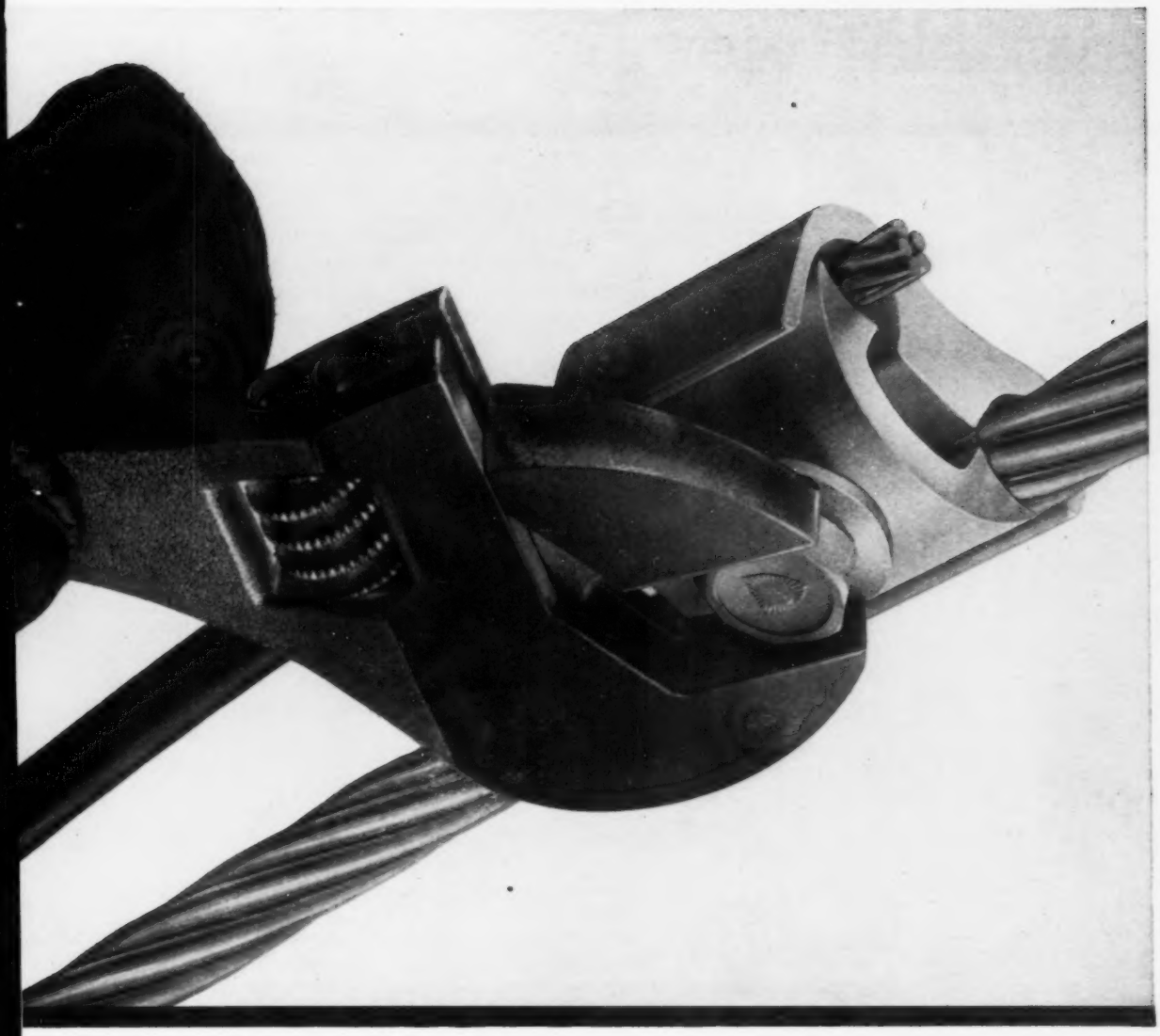
REDUCED BULK in Alcoa's new 390-490 series clamps makes them easy to tape; gives a neat, more compact appearance on the line, makes them easier to store and handle.

All loose parts eliminated... reduced bulk gives neater appearance

Now you can get the benefits of Alcoa's universal groove design previously announced for heavy-duty clamps. Two new Alcoa single-bolt, distribution and service-drop-type extruded clamps* accommodate ACSR and stranded aluminum sizes #6 to #2 7/1 (Catalog 490.0) and #6 to 2/0 (Catalog 396.6).

Top and bottom parts of the new clamps are Alcoa® Extrusions —made strong, solid and dense from heat-treated alloy. Grooves are specially treated and coated

*Patent applied for



to provide low-resistance surfaces. All parts are aluminum to equalize expansion, eliminate corrosion. The new extended lip prevents cap from turning when being applied.

Other benefits you get with these economical new Alcoa clamps are easier application and handling. Loose parts have been eliminated. These clamps can be applied "hot." Bolts are anodized to reduce thread friction. A supply of these clamps on your trucks will cover most distribution applications. Simplified ordering and stocking, and fast delivery, also save you money.

When you specify Alcoa parallel-groove clamps, you also buy the experience gained during a quarter of a century of manufacturing clamps and other accessories for aluminum . . . plus years of extensive laboratory testing. Ask your Alcoa representative to show you samples of these clamps. Call him today for full information, or write Aluminum Company of America, 2308-E Alcoa Building, Pittsburgh 19, Pennsylvania.

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Your Guide to the Best in Aluminum Value

"ALCOA THEATRE"
Exciting Adventure,
Alternate Monday Evenings

editorial views

A Good Swap

THE high cost of computing machines and the scarcity of computer engineers has laid the foundation for a new program sponsored by the American Institute of Electrical Engineers wherein programs for electric utility engineering problems can be exchanged. Already 92 electric utilities have made available their punch cards or magnetic tapes that set forth system engineering problems in digital computer language.

The cost of programming varies but the program for a problem must be "translated" before the computer works with it.

The free exchange of computer problems would benefit all fields of engineering immeasurably. Here is a new area where the traditional cooperation between engineering groups can pay handsome dividends.

What Price Education

MODERN Paul Reveres are riding throughout the countryside warning the populace that our educational institutions have become second-rate and incapable of meeting the demands of the space age. The air is full of charges and countercharges, recommendations, suggestions and all sorts of panaceas calculated to increase the quantity and quality of college graduates.

Some of the comments about the end results of this situation may be valid but our colleges and universities are coming in for far more criticism than they deserve, considering the fact that, for years, they have not had a status much greater than that of poor relations. For years university chancellors and leading educators have spent most of their time trying to get funds. For years many of the people on the staffs of these same universities have been drawing pay that is barely equal to that of a skilled craftsman. For years, it's been a continual struggle to stretch budgets to get the modern equipment and facilities necessary to do an adequate educational job.

Now the situation is approaching that of a crisis. Unless some real brutal screening measures are used, the precentage of young people attending college is going to reach astronomical proportions. Pres. Howard R. Bowen of Grinnell College points out that there are 9,000,000 young people of college age now and the number is expected to reach 14,000,000 by 1970. At present about one-third of all young people of college age are in college as against 15% in 1940 and 8% in 1920. Unless there is some real hard-headed business thinking about the problem of providing adequate plant and well-paid teachers, there is a good possibility that higher education in the U. S. will become something akin to a diploma mill.

C. W. De Kiewiet, president of the University of Rochester, estimates that it will take approximately $8 billion to provide the new space needed for American higher education in the next decade. It's going to take another big chunk of money to staff these new facilities with competent, properly paid educators. It is not to be expected that the educators of the country can produce funds of this magnitude. They will not be forthcoming unless the people as a whole and business in particular cast aside the veil of indifference and "let George do it" attitude that have permitted the situation to deteriorate to its present state.

The country's educators are going to need a lot more help than they have had in the past. American business and industry has been generous in granting fellowships and scholarships. In the main, these only aggravate the problem. To legislators, scholarships or cheap tuition are good politics; to corporations scholarships are good public relations; to universities, without help for classrooms and faculties, they provide an ever-increasing burden.

Considering that American industry has spent some $250 billion in new plant in the past decade, the 10-year educational requirements for new plant of $8 billion do not seem beyond the capabilities of a country as rich, as large and as wasteful as ours. If this country wants a first-class educational system it's going to have to look upon the educational plant and its staff as big business and apply some businesslike methods in arranging to finance it. The time for complacency and indifference has long been past. The business world as a whole must accept the challenge and assume more responsibility to see to it that our educators are given the wherewithal to do the job that must be done.

Value Received

THE excellence of the recent engineering and operating committee meeting of the Pacific Coast Electrical Assn. in San Francisco emphasizes the need and benefit attained from such gatherings. Apparently there was much that the guidance and program committees felt needed discussion. The 900 engineers who participated were given a wide choice of subjects on which to concentrate their attention and were treated to many excellent technical papers which showed care and thought in their preparation and presentation.

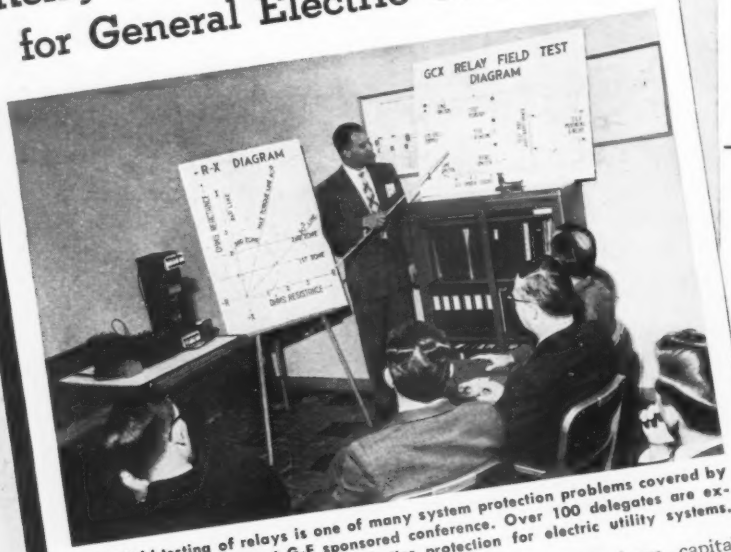
One impression that might be gained from the program is the fact that the variety, importance and volume of the subject matter meriting discussion might have exceeded the two days of time allocated for the meeting. As many as eight parallel sessions made it difficult for many of the participants to choose between the three or four in which they might have had primary interest. Undoubtedly the frequency, length and methods of presentation of the growing volume of pertinent subject matter for these meetings is a matter for continuing study by the guidance committee of the PCEA.

With the growing complexity of electrical systems, meetings of this type take on added significance and importance. The exchange of new ideas from the forum, the informal discussions of current practices at the luncheon table and in the hospitality rooms and the camaraderie of becoming better acquainted with one's contemporaries in the engineering field, all contribute to the very real values that the "working" sessions of our industry's associations offer to those who attend.

IN ITS 1957 annual report, the corporation pointed out that not only is personal initiative being jeopardized but also the "steep progressive taxation" of individuals is eliminating a major source of investment capital upon which industrial progress depends. "Taxing the more skilled and the more productive at ever increasing rates undermines both their incentive and ability to provide the venture capital on which new jobs depend. . . . In a similar manner the tax laws are penalizing efficient business enterprise. . . For each dollar of profit for dividends or reinvestment at present tax rates, more than one dollar must be paid to the government. . . The company that operates more efficiently pays a higher tax per unit of production and thus in effect pays a penalty for being more efficient. Taxes levied at high rates against efficiency cannot help but impair that efficiency and it may well be time to ask if this can be in the public interest." — From the annual report of the United States Steel Corp.

Philadelphia, March 10, 1958...

Relay experts in Philadelphia for General Electric Conference



Better field testing of relays is one of many system protection problems covered by small discussion groups at G-E sponsored conference. Over 100 delegates are exchanging ideas on how to provide better protection for electric utility systems.

PHILADELPHIA, PA., MARCH 10—The first of two week-long technical sessions dealing with electrical relays opened today at the Penn-Sherwood Hotel. Some 114 relay experts representing producers of about three-fourths of the nation's electric power are attending the symposium sponsored by the General Electric Co. "Planning Protection for Tomorrow's Systems" is the conference theme.

Small group discussions will continue through Friday afternoon, led by specialists from General Electric's Low Voltage Switchgear Dept. in Philadelphia, the Electric Utility Engineering Section in Schenectady, N. Y., and Communication Products Dept., Syracuse, N. Y. Delegates will also tour G-E switchgear manufacturing and laboratory facilities and see a demonstration of new carrier-current and microwave relaying.

Relays detect any abnormal performance on a power system and initiate corrective action. Designing relay systems is considered a special science in the field of electrical engineering. The planning of a huge power system costing millions of dollars is vitally affected by how efficiently it can be protected by relaying. Sometimes large capital savings can be achieved by changing the design of the relay system at a fraction of the cost of the main power equipment.

"Planning Protection for Tomorrow's Systems"

Relay specialists pool their knowledge to plan improved system protection

With the trend to heavy loading of transmission lines and the growing demand for increased service continuity, the search for better relaying becomes vitally important. Conducted as a series of small group discussions, these General Electric sponsored engineering conferences permit an interchange of ideas, experiences and opinions on relays, methods and practices. Recognized protection problems in various power system areas are discussed, and conferees evaluate possible solutions. Sharing the collective contributions of knowledge between utility and General Electric relay specialists will result in better protection of the modern power system. General Electric Co., Schenectady 5, N.Y.

301-380

MORE POWER TO AMERICA

GENERAL ELECTRIC

ELECTRICAL WEST SPOKESMAN FOR MOST HIGHLY ELECTRIFIED REGION OF THE U.S. VOL. 120 NO. 5 MAY 1958

With the contractor on the team . . .

Adequate Wiring Can Be Sold

D. L. Jackson*, Vancott Electric Co. Inc., Los Angeles

The contractor must be the key salesman in the over-all wiring program. He is the member of the team who receives the largest share of immediate profit benefit. He is in the position of having the most direct effect on the prospect.

Local NECA chapters can do a tremendous job in selling more contractors on taking advantage of the benefits of Adequate Wiring's Usepower program. Almost all of you at one time or another have been confronted with the "sell down" policies of too many electrical contractors. But today we have a far better chance of combatting this thinking at the customer level. Thanks to the advertising programs of the National Wiring Bureau, utilities, manufacturers and the NECA, many more customers now understand that they must find out what "use" they will derive from a contractor's wiring proposal.

Almost any successful contractor can testify that the "sell down" approach eventually has its day of reckoning. The man who thinks along these lines always seems to manage to sell down his own profits.

Examples Are Best Approach

The best approach when confronted by a prospect who exposes a competitor's sell down bid is to have a few specific examples ready.

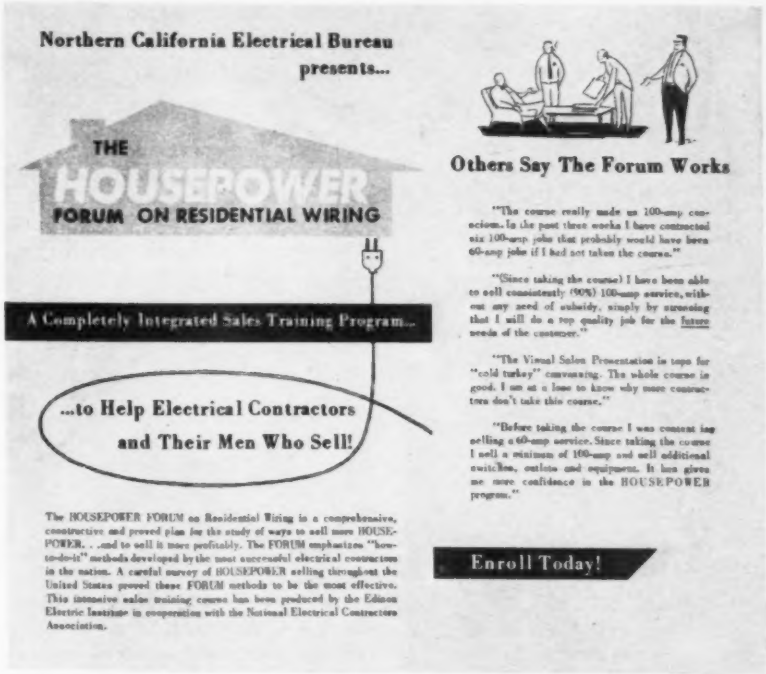
1. Tell the customer about the recently built apartment house having rental problems because the owner couldn't "see" the extra construction expense for wiring suitable for supplying room air conditioners.

2. Tell the customer in actual dollars and cents how much it will cost to install the adequate wiring over and above what it would have cost originally.

3. Have a known specific example of one of the many manufacturing plants that have had one, two, or even more increased service charges in as many years because the contractor did not, or would not, try to sell the customer some capacity for the future.

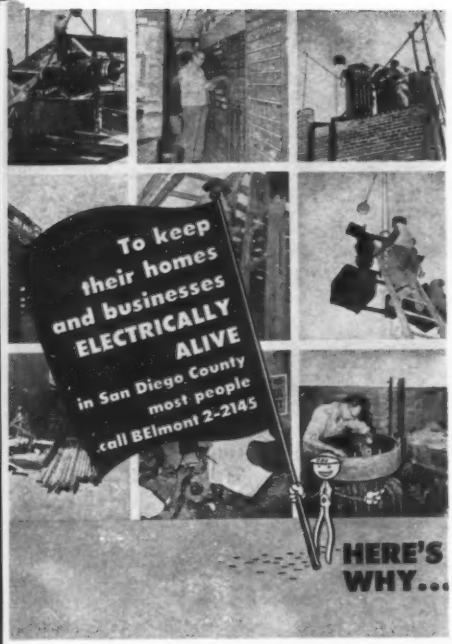
4. Cite some commercial or retail store that has recently done a poor job of relighting, similar stores that have modern lighting in adequate quantity.

After one or more of these examples have been spelled out verbally to the prospect, try for the clinches. Make a strong pitch for him to spend an hour or two with you seeing for himself the things you have been describing. Try to arrange a casual conversation between your prospect and the building owner who has already paid a tidy sum for not buying an adequate job originally. This owner can prove to be your best salesman.

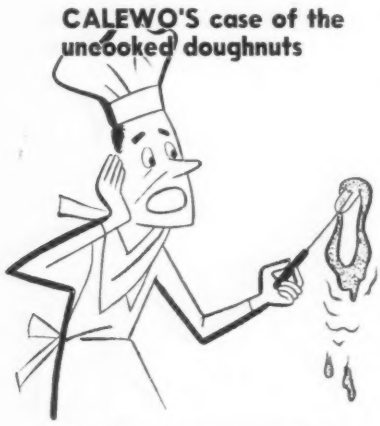

Northern California Electrical Bureau presents...
THE HOUSEPOWER FORUM ON RESIDENTIAL WIRING
A Completely Integrated Sales Training Program...
...to Help Electrical Contractors and Their Men Who Sell!
The HOUSEPOWER FORUM on Residential Wiring is a comprehensive, constructive and proved plan for the study of ways to sell more HOUSEPOWER, . . .and to sell it more profitably. The FORUM emphasizes "how-to-do-it" methods developed by the most successful electrical contractors in the nation. A careful survey of HOUSEPOWER selling throughout the United States proved these FORUM methods to be the most effective. This intensive sales training course has been produced by the Edison Electric Institute in cooperation with the National Electrical Contractors Association.
Others Say The Forum Works
"The course really made us 100-amp conscious. In the past three weeks I have contracted six 100-amp jobs that probably would have been 60-amp jobs if I had not taken the course."
"Since taking the course I have been able to sell consistently (90%) 100-amp service, without any need of subsidy, simply by stressing that I will do a top quality job for the future needs of the customer."
"The Visual Sales Presentation is tops for "cold turkey" canvassing. The whole course is good. I am at a loss to know why more contractors don't take this course."
"Before taking the course I was content in selling a 60-amp service. Since taking the course I sell a minimum of 100-amp and sell additional switches, outlets and equipment. It has given me more confidence in the HOUSEPOWER program."
Enroll Today!

Among selling aids offered the contractor are salesmen training courses sponsored by industry groups. Here are two pages from folder on NCEB's Housepower Forum, which included conferences; a visual sales manual and booklets to take away for reference

*From a talk before the Business Development Section of the Pacific Coast Electrical Assn. at Los Angeles, March 7, 1958.



Selling tools used by California Electric include a brochure with impelling cover...



...cartoons to brighten mailing pieces...

...a follow-up postcard to say "thank you"

"No Time to Fool Around"

The most common complaint from contractors who are not doing the selling they should is that they don't have the time to "fool around" with such promotional ideas and still maintain their businesses. I would ask these men to stop and reason a little.

Most of us in the contracting business are quite aware of hourly pay rates. The contractor who claims he has insufficient time for a selling job may not realize how high an hourly rate he can command. Is his time worth $100 per hour; $200, or even more? Well, it's all up to him! The hours spent being a vigorous salesman will prove to put the most dollars in his pocket. How can any contractor be too busy to grab these dollars?

We of the NECA have a definite educational job to perform. The tools such as national advertising and power rating sheets are here now waiting for use.

Our contractors must be saturated with these ideas. Unfortunately, in the past relatively few contractors have actually been spurred to do much original promotion. But things are different now. It is tough to get a job – particualrly a job with a profit in it. Today's economic picture should have the effect of making all of us contractors get down to some real scratching for profit-making ideas. What better avenue is there than beating the bushes to come up with some relatively less competitive work?

One good source of business leads is often completely overlooked. The contractor who operates a service or repair business rarely gives more than a passing glance to the one- or two-hour service call. But herein may lie his best opportunity.

The contractor may not consider his electrician as a salesman but he certainly should be one. The electrician is on the customer's premises. He can see what is inadequate. The contractor should train these men to be curious; should encourage information from them, then follow up the leads. Sales will result. The last issue of the *Adequate Wiring Reporter* tells of a New York contractor who sold an air conditioning rewiring job of nearly a half million dollars from an original lead through a service call.

The contractor must possess a working knowledge of the latest in lighting developments. What is worse than a contractor who will attempt to sell an open-pan slimline job just because he does not understand how to estimate and install the luminous area lighting the customer has seen in some other new office? Most people want the latest and smartest designs in whatever they purchase. The sharp contractor will be on the top of the new items and will instill the desire in a prospect just as a manufacturer's salesman does.

An example of what can be done is California Electric Works of San Diego, which has grown to a firm of 200 employees by promoting adequate wiring. In a talk before the National Wiring sales conference in Detroit, Norman D. Ferguson, president of this firm, said that sales promotion became his success theme shortly after World War II, when sales were sliding and performance slipping. Ferguson told how he managed first to make the attitude of every employee friendly to the customer. "Friendly" included the listing of the home telephone numbers of all service electricians and executives for the customer's emergency use. The customer needing emergency service is invited to pick the nearest employee and roust him out of bed in the middle of the night. He gets it and a smile too!

Mr. Ferguson also has a startling approach to advertising for a contractor. He has retained a professional advertising company to handle promotional advertising – a commonplace among manufacturers and utilities but unusual for contractors. It should be a sound idea for the larger contracting firms.

California Electric Works uses direct mailings, newspaper ads and radio spots. More than 4,000 direct mailings are sent each month to a selected list of customers and prospects. These mailings follow a regular color theme for easy recognition and each carries a timely message. If work is slow in the motor repair shop, for instance, the monthly mailing will highlight this service and perhaps offer a bargain. Samples and gadgets often are attached to the mailings to attract attention to a particular product.

Of course advertising alone will not roll in profits automatically. California Electric has a staff of regular salesmen trained to capitalize on the various leads and do a selling job.

I firmly believe the electrical contractor will become increasingly aware of his part in tapping the latent market now at hand. From now on, the electrical contractor will have fewer excuses and a great deal more action.

Heavy storms in five areas bring notable exceptions to the "normal or better runoff" prediction for Western streams in this year's . . .

Water Supply Outlook

Homer J. Stockwell
Snow Survey Supervisor, Soil Conservation Service
Fort Collins, Colo.

Norman S. Hall
Snow Survey Supervisor, Soil Conservation Service
Reno, Nev.

Normal or better runoff from snowmelt is expected for most streams in western United States in 1958. Exceptions are notable and cover a large area. Heavy storms during March, particularly in late March and early April, covered California, Nevada, southern Utah, central Arizona and southwestern Colorado.

In California especially rainfall at lower elevations was heavy and damaging. Within a few days the snowpack at higher elevations increased from a near average seasonal snowfall to one of the highest on record. Based on a partial inventory of the snowpack on April 7, forecasts for Central Valley streams in California are placed tentatively by the California Department of Water Resources in the range of 150 to 180% of normal. As a result of this storm, streamflow forecasts of 125 to 150% or more of normal in Arizona, Nevada, southern Utah and southwestern Colorado are commonplace at this time.

In the Pacific Northwest and along the Continental Divide streamflow next summer is expected to be near average.

In all of the West, water supplies for irrigation, municipal and other consumptive uses will be at least adequate to meet usual demands for this year. In general, streamflow during 1957 exceeded demands. This encouraged substantial reservoir storage hold-over, thus adding to the 1958 season's total water supply. Winter rainfall has left irrigated soils relatively wet, which will reduce demands for early reservoir withdrawals.

The outlook for hydroelectric power potential is improved over a year ago and is above normal. Storage in major power reservoirs is up, except for the Columbia River where power production is more limited by fall and winter flows than by storage.

On the Platte and Bighorn power generator systems in Colorado and Wyoming, reservoir storage is well above normal and 50 to 60% of capacity. With runoff in these areas expected to equal or exceed normal, coupled with a prospect of limited early water demand, water stored for power purposes should be extremely favorable at the end of the irrigation season. This is especially true of the North and South Platte systems.

On the Colorado River, Lake Mead contains over 19,000,000 acre-ft in usable storage. With an inflow of over 10,000,000 acre-ft during the April-July 1958 period forecast, the total storage should approach, but probably not reach, full spillway level. Hydroelectric potential here is much better than any year since 1952. High runoff forecasts for California streams, along with better than average reservoir storage, improves the hydro outlook there.

The favorable water supply situation for this year is, of course, only temporary. In many areas of the West long-term water demands exceed the available supply. An adequate and even plentiful supply for this year should not be regarded as an invitation to waste or carelessly use water that could be saved. Next winter's snowpack may be less favorable. Storage now available or in prospect may well be the difference between satisfactory water supplies and shortages a year or so hence.

Forecasts of 1958 water supply conditions in the West are based on April 1 measurements by the U. S. Department of Agriculture, Soil Conservation Service and many cooperating organizations* on about 1,300 snow courses and 100 soil moisture stations in mountain areas. The

*The Soil Conservation Service coordinates snow surveys conducted by its staff and many cooperators, including the Bureau of Reclamation, Forest Service, Geological Survey, other Federal Bureaus, various departments of the several states, irrigation districts, power companies and others. The California State Department of Water Resources, which conducts snow surveys in that state, contributed the California figures appearing in this article. The Water Rights Branch, British Columbia, Department of Lands and Forests, has charge of the snow surveys in that province and likewise contributed the information here for British Columbia.

Snow surveyors measure moisture content of first several feet of soil at permanent installations on snow courses

amount of storage in nearly 250 reservoirs also is considered in appraising the water supply outlook.

Forecasts for major streams of the West for the April-September 1958 period as compared to normal:

Columbia River at The Dalles, Ore., 93,000,000 acre-ft, 96%; Missouri River at Fort Benton, Mont., 3,258,000 acre-ft, 96%; Colorado River at Grand Canyon, Ariz., 11,300,000 acre-ft, 112%; Sacramento River inflow to Shasta Reservoir, Calif., 3,650,000 acre-ft, 150%; San Joaquin River below Friant Reservoir, Calif., 2,270,000 acre-ft, 163%.

The accompanying chart showing the status of reservoir storage and a map indicating the approximate runoff forecast for each area summarizes the 1958 water supply outlook for the West. In the following paragraphs the water supply outlook by state is briefly reviewed.

Arizona — Snowpack as of April 1 is about 300% of normal in the Salt and Gila River watersheds and 75% in the Verde River watershed. Runoff during January through March has been above average, and with runoff for April through May forecast from average to much above, it will bring the total January through May runoff to about 200% of average for the Upper Gila, 130% for the Salt River, and 120% for the Verde River.

Heavy February and March precipitation changed the water supply outlook in Arizona from poor to the best since 1952. There will be adequate water for the normal irrigation and some carry-over storage for next year. Groundwater overdraft will not be relieved, however.

British Columbia — According to Water Rights Branch, British Columbia spring and summer volume streamflows are expected to be similar to the past 10-year normal in the Columbia, Fraser, North Thompson and South Mainland Coastal regions. Below average water supplies are predicted for the Kootenay, Okana-

gan, Similkameen and Skagit areas, with the Nechako watershed the only one in the province expected to provide above average runoff.

The past winter has been mild. This has resulted in a greater than normal portion of winter precipitation from rain. The snowpack density is high. On most basins the snow line is at a relatively high elevation.

California—California Department of Water Resources reports that the water supply outlook for the coming season is for above runoff, markedly above normal for the entire state. Runoff during the snowmelt period should be among the highest on record.

This outlook comes as a result of one of the wettest winters in recent years. For example, precipitation over the entire state since last July averages almost 160% of normal. Record-breaking storms occurred in February, March and early April. Runoff during the first six months of the water year has been about 190% of average. In fact, runoff in most of the streams in southern California is above normal for the first time in several years. Late March and early April storms brought substantial increase to the state's snowpack and it is estimated that snow-stored water is 140% of normal.

Water stored in surface reservoirs on April 1 was about 120% of average.

Consequently, runoff during the remainder of the 1957-58 water year on major snow-fed streams is expected to average about 160% of normal.

Colorado—Water supplies will be adequate for all irrigated areas in Colorado this season. Snowfall has been average or above in the mountains except for two small areas on South Platte tributaries north of Denver. Well above normal snowfall has been measured in southwest Colorado. Soils under the snow are wetter than usual in the southern half of the state, but about average in the north.

Contributing to the favorable water supply outlook is the large carry-over in irrigation reservoirs from the heavy streamflow year of 1957. Excluding the larger conservation and flood control reservoirs, storage is now 70% of capacity as compared to only 21% a year ago. In contrast to recent drought years, soil moisture conditions in irrigated areas are good.

The excess snowfall on the San Juan Mountains in southwestern Colorado gives cause for concern lest damage from high streamflow occurs. Snowpack is approaching the recorded maximum measured on May 1 and June 1, 1957. Since mountain soils are wet, very little snow water will be required to prime these soils. Flows equal to or exceeding the high flows of 1957 are definitely possible.

Idaho—Water supply outlook for northern Idaho is for normal streamflow during 1958. In the southern half of the state, the snowpack is well above normal and forecasts of good streamflow are general.

The Blackfoot and Portneuf Rivers in eastern Idaho still have a heavy snowpack, but melt conditions have been favorable for reducing the snowmelt flood potential. The south slopes of these drainages have been melted clear at the lower elevations and significantly reduced at high altitudes. Heavy rains on these rivers would produce extremely high water, but the chances of a maximum snowmelt coinciding with rainfall are rather small.

Reservoirs in Idaho are above normal, and the new Palisades reservoir on the Snake River will fill for the first time in 1958. This reservoir alone adds more than one million acre-feet of stored water that has not been available in the past.

The Upper Columbia and Kootenai Rivers are forecast to flow a little below normal for 1958. The water supply for these rivers is adequate, but they do not pose the high water potential that has occurred several times in the recent years.

Montana—Water supply outlook along the major streams in Montana is good for 1958. Streamflow east of the Continental Divide is expected to be about 90% of average and equal to a year ago. In the Columbia Basin streamflow will be a little above normal and slightly more than in 1957. Streamflow during the winter has been below average in the mountains and extremely deficient in prairie streams. Reservoir storage is near average. Soils in irrigated areas are wetter than in recent years.

Nevada—This will be the best irrigation water year since 1952. Forecasts on the Owyhee River in northern Elko County are for about 177% of normal, 132% on the main Humboldt at Palisade, 125% on the Walker watershed, and 148% on the Carson River system.

Early April storms have increased the mountain snowpack, especially in the Sierras. Water content of the snow courses are below those measured in the record-breaking year of 1952. Most reservoirs are being lowered in anticipation of the high expected flows.

The Truckee Basin Water Committee reports that all of its reservoirs will be filled to capacity. On April 1, the elevation of Lake Tahoe was 6228.25, storing 630,000 acre-ft. Controlled releases are being made to keep the lake below the legal maximum.

April 1 storage in seven important reservoirs was 78% of capacity or 120% of the 15-year 1938-52 normal. During March, Rye Patch reservoir storage increased about 19,000 acre-ft. It now stores 100,000 acre-ft normal for this time of year.

New Mexico – The water supply outlook for New Mexico is the best in about 10 years. The flow of the Rio Grande through New Mexico is expected to be near normal for the first time since 1952. Snowpack in northern New Mexico, although not excessive, is 140% of normal. Mountain soils are wet. Storage in Elephant Butte reservoir is about 85% of normal as compared to 10% of normal a year ago. Water supply for the Tucumcari and Carlsbad projects is also favorable with relatively high reservoir storage. There is good soil moisture in irrigated areas, and at least average runoff is expected from snowmelt.

Oregon—Oregon will have average to abundant water supplies for irrigation this year. Even if the winter has been unusually warm the mountain snowpack is 114% of average and 85% of a year ago. The streamflow forecasts vary from a low of 90% of average on the Clackamas River to a high of 164% on the Owyhee River. Watershed soils under the snowpack are well wetted throughout the state – a factor which will favor an adequate runoff from snowmelt. However, lack of low elevation snow may cause late season shortages on streams with low elevation watersheds.

Reservoired water supplies are 129% of average and 81% of capacity in 23 important reservoirs.

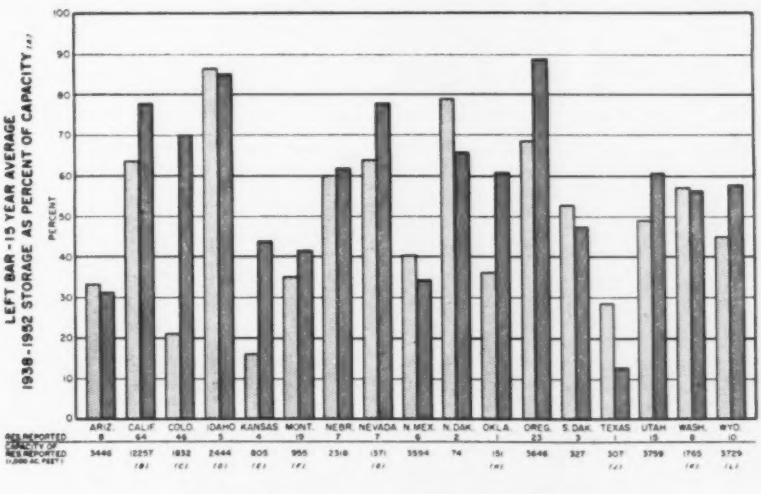
Texas—With near average storage in Elephant Butte reservoir in New Mexico and a normal snowmelt inflow in prospect, the water supply outlook for the irrigated area along the Rio Grande in west Texas is the best for several years. Soil moisture conditions in irrigated areas are relatively good. In contrast, the Pecos area has poor prospects at this time. Soil moisture conditions there are good, but the storage in Red Bluff reservoir is extremely inadequate.

Utah – Water supply outlook for Utah is the best for several years. Storms during March increased the snowpack from 100 to 1,000% of the normal increment for the month. All streams in the state are now forecast at above normal flows except for the eastern part of the Uinta Basin where the range is 90% to 100% of normal. For the state as a whole, the snow cover is 117% of normal for April 1. The effects of March storms extended over into the Colorado drainage and resulted in substantial improvements in the water supply outlook in Colorado River tributaries. Forecasts on the Price and San Rafael Basins are now from 125 to 150% of average. The Sevier River Basin, which has had deficient water supplies for several years, will have above normal runoff this year. The flow of the Virgin River will be slightly above normal. Streamflow in northern Utah is expected to be about average.

Storage in 15 principal reservoirs is now 3,759,000 acre-ft, which is 61% of capacity and 124% of average.

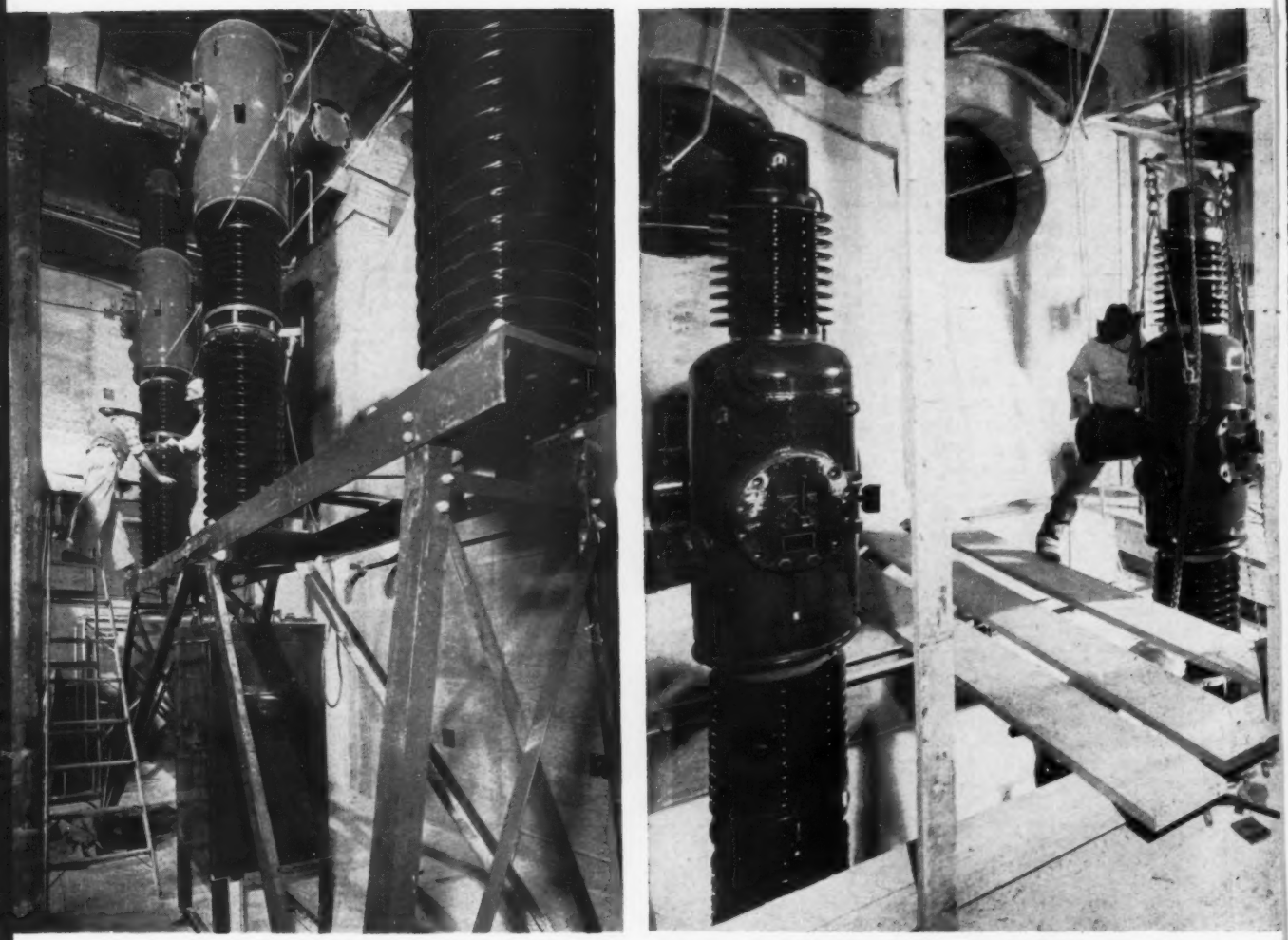
Washington – Water supplies for areas of Washington east of the Cascade Range are expected to be generally adequate for the irrigation farmers. Possibility of water shortage is not likely in the central areas of Washington, but limited flows can be expected on the Okanogan. Forecasts of streamflow range from 86 to 104% of normal. In the state as a whole the snowpack has below normal amounts of water for this time of year. Irrigation reservoir storage is generally below average as of April 1, although there are above normal amounts of water in storage in Conconully and Salmon Lakes. Power reservoirs also have less water in storage for this time of year than average.

Wyoming—Prospective streamflow from the high mountain watershed varies from 60% of normal on the Popo Agie tributary to the Wind River to 120% of average on the North Platte into Seminoe reservoir. Flow of the Green River in the Colorado River Basin will be near normal and adequate for all needs this year. The outlook is similar for the Snake River and its tributaries in western Wyoming. Storage in the Seminoe, Pathfinder, Alcova and Guernsey reservoirs on the North Platte totals about 1,625,000 acre-ft, twice normal for this date. Soil moisture in irrigated areas of eastern Wyoming is good. With more than 1,000,000 acre-ft inflow expected in these reservoirs during the April-September period, good water supplies for the year are assured. The outlook is favorable for two or three years even if future snowfall is deficient. More than 75,000 acre-ft is in storage in the Wheatland reservoir, and above normal flow is forecast for Laramie River. The water supply outlook for the Wheatland district is the best of recent years except for last year.



Reservoir Storage as of April 1, 1958

Explanation: (A) Most state averages for reported reservoirs are for a 15-year period (1938-52) but in a few instances reservoirs with shorter records have been included; (b) does not include Pine Flat, Fulton, Berryessa, Cherry Valley, Vermilion, Cachuma, Isabella or Santa Felicia reservoirs (combined capacity 4,862,000 acre-ft), April 1, 1958, combined storage 2,405,000 acre-ft; (c) does not include John Martin reservoir on the Arkansas River (capacity 655,000 acre-ft), April 1, 1958, storage 278,000 acre-ft, or Granby, Horsetooth and Carter Lake on the Colorado-Big Thompson project (combined usable capacity 723,000 acre-ft), April 1, 1958, combined usable storage about 510,000 acre-ft; (d) does not include Cascade, Anderson Ranch, Lucky Peak or Palisades reservoirs (combined capacity 2,557,000 acre-ft), April 1, 1958, combined storage 1,411,000 acre-ft; (e) includes John Martin reservoir and three reservoirs known as Great Plains reservoirs on Arkansas River in eastern Colorado affecting water supply in western Kansas; (f) does not include Fort Peck reservoir (capacity 18,800,000 acre-ft), April 1, 1958, storage 11,530,000 acre-ft; or Canyon Ferry, Flathead or Hungry Horse reservoirs (combined capacity 7,334,000 acre-ft), April 1, 1958, combined storage 6,046,000 acre-ft; (g) does not include Lake Mead (capacity 27,207,000 acre-ft), April 1, 1958, usable storage 19,092,000 acre-ft, or other Colorado River channel reservoirs below Lake Mead; (h) W. C. Austin reservoir (new in 1945); (j) Red Bluff reservoir on Pecos River; (k) irrigation reservoirs only, does not include Franklin D. Roosevelt Lake or Grand Coulee equalizer (combined capacity 5,834,000 acre-ft), April 1, 1958, combined storage 2,074,000 acre-ft; (l) does not include Boysen reservoir (capacity 560,000 acre-ft), April 1, 1958, storage 213,000 acre-ft



Close quarters during installation indicates main reason for selection of air-blast breakers over oil equipments

Here's why PG and E chose 115-kv . . .

Air-blast Breakers for Station X

F. B. Schullerts
Senior Electrical Engineer, Engineering Department
Pacific Gas and Electric Co.

Pacific Gas and Electric Company's indoor station X in Oakland, Calif., was originally constructed in 1908, with building additions in 1909 and 1925. Minor equipment changes were made during the intervening years. By 1954, major improvements were required to increase the reliability and capacity of the station output. Part of the program included the replacing of switching facilities on the high side of the four 25,000-kva, 110/12-kv transformers. This was done to gain increased interrupting duty over the obsolete nonautomatic oil circuit breakers that were suitable only for interruption of the transformer excitation current. It was for this service that 115-kv air-blast breakers were selected and now, after three and a half years of engineering and construction, are installed and operating.

Choice of the air-blast breaker over the conventional oil circuit breaker was based on the following considerations:

1. For an indoor station, it is desirable to eliminate the use of oil

as much as it is possible to do so.

2. Space was at a premium and, for this reason, dimensions favor the air-blast breaker for this installation.

3. Access openings to the 115-kv circuit breaker compartments would not accommodate oil circuit breaker dimensions without the removal of portions of thick concrete walls.

4. The power transformers were equipped with bushing current transformers, and means were available in the station for obtaining instrument potentials of 115-kv bus. This made it possible to utilize an air-blast breaker in its most simple and economical form.

All these factors favoring the application of the air-blast breaker stimulated the idea of pioneering the company's first 115-kv air-blast breaker installation.

The Breaker Rating

The air-blast breakers finally selected were manufactured by General Electric Co. and rated at 115-kv, 1,200-amp, 5,000-mva interrupting rating, three-cycle interrupting time and reclosing time of 20 cycles. The arc interruption takes place in a welded steel tank and in an atmosphere of specially dried air which has been compressed to a maximum of 500 psig. Sufficient air supply is available at each breaker for two complete close-open cycles without replenishment of compressed air from the central air storage system.

Compressed Air Supply System

The compressed air supply is provided by two compressors, together with air drying apparatus and air receivers. The compressors are self-contained air cooled, and are provided with pressure-actuated switches for sequential operation. Switching is also arranged to permit periodic changing of sequence of operation in order to equalize operating time of the two compressors.

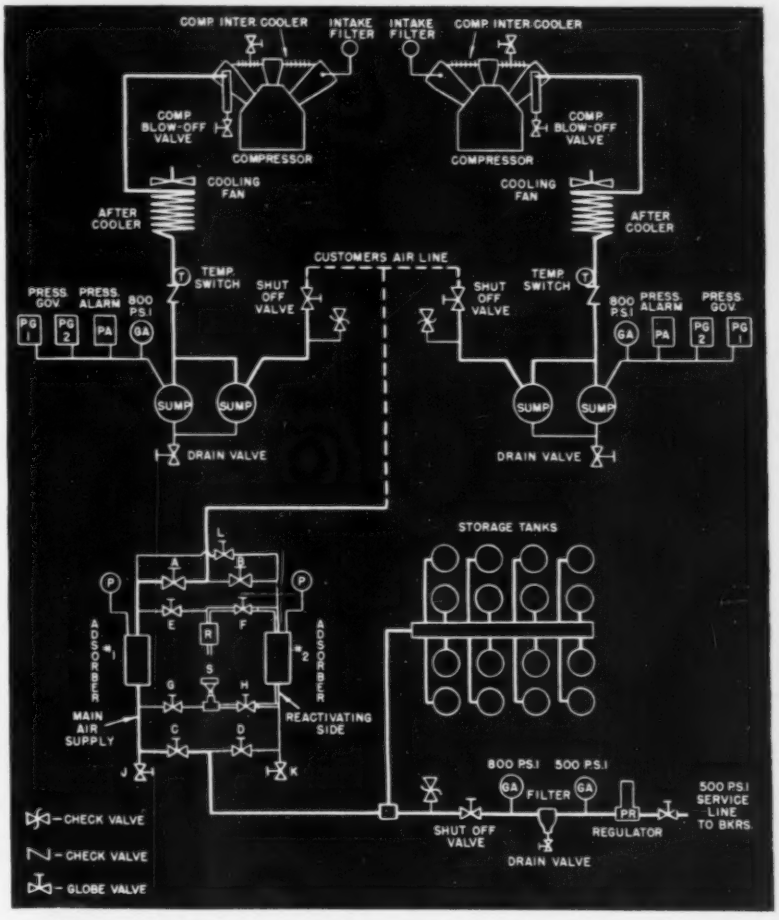
The compressors are capable of delivering air at 800 psig to two desiccant-type air drying units—each of which is designed to reduce moisture content of the air at this pressure to a minus 20 F dew point. Each drying unit is capable of removing only a fixed amount of moisture; consequently, when this point is reached, the second unit is placed into service and the first unit reactivated to be made ready for service again. From the dryers the 800-lb air passes to 16 air storage cylinders, and also to an 800/500-psig pressure regulator, thence to a header. The 500-lb air from the header is run in individual pipes to each air-blast circuit breaker. In addition, the air supply system from compressor to breakers is provided with valves, filters, drains, alarms, etc., as required. A check valve at each breaker location prevents exhausting the entire air supply system in the event of a local air leak. Local alarms report this condition if it should occur.

The vital part of the air-blast breaker is, of course, the interrupter element with its main control valves and relays. A steel structure and porcelain insulators support the interrupter physically and electrically, respectively. A metal cabinet houses the main control valve, relays, terminal blocks, space heater, etc.

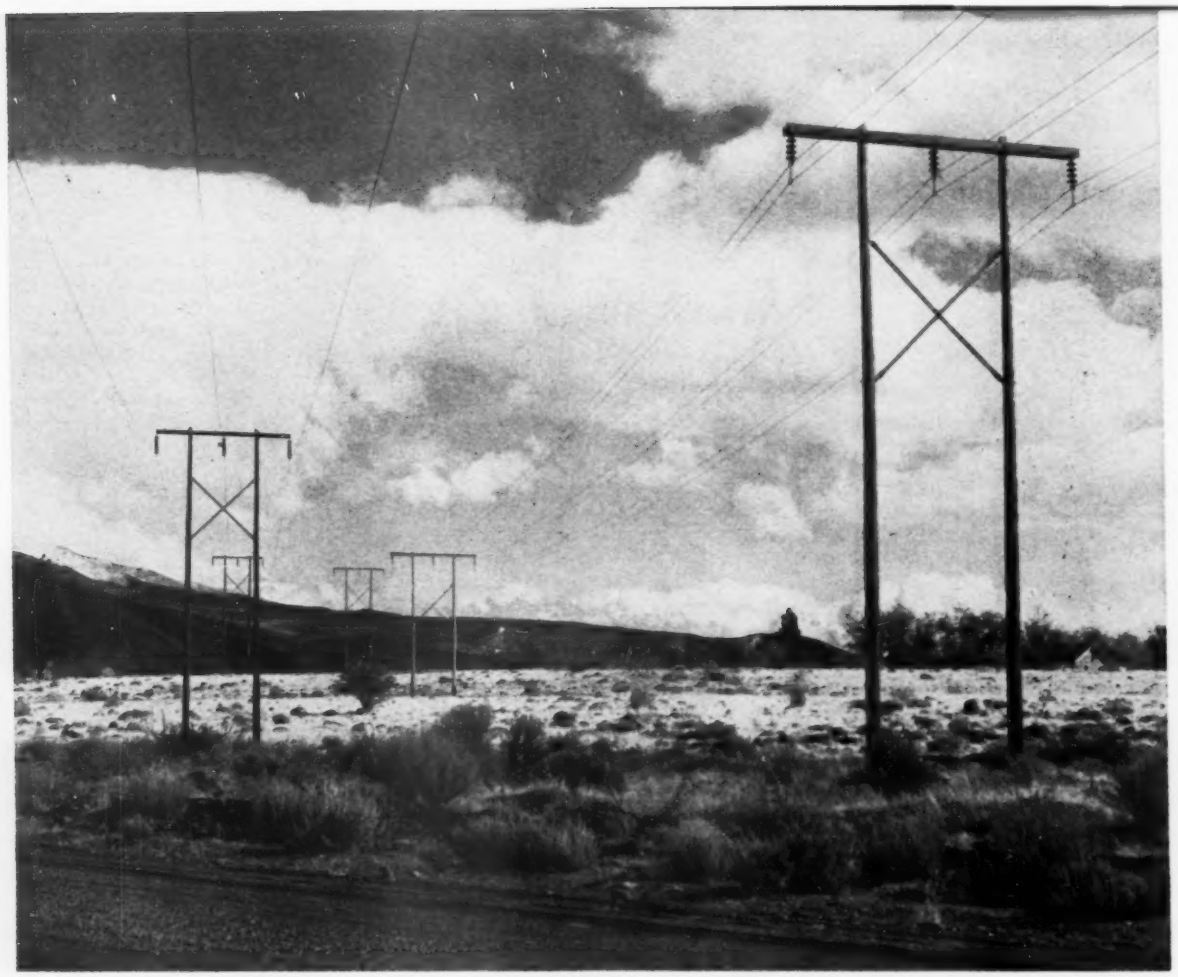
A complete description of the actual process of circuit interruption is very detailed and lengthy and is, therefore, beyond the scope of this brief article. The breakers were tested at the factory before shipment to meet specifications which required reference to NEMA Power Circuit Breaker Standard, Publication No. SG4-1954. After installation, oscillograph tests of the breakers were made to verify results of factory tests and to reveal any readjustments that may have become necessary because of handling or jarring during cross-country transportation.

A loud noise accompanies the breaker operation even under unloaded conditions. It was found necessary to provide sound-absorbing materials over windows on the street side of the station and to keep all other windows and doors closed except for those required for ventilating purposes.

Since these breakers were installed and put into service only very recently, no "in service" operating record can be commented upon at this time. The breakers to date have not been called upon to interrupt any fault currents, but have been used satisfactorily to switch out their respective transformers for clearances to perform other work in connection with the present reconstruction project.



Heart of air breaker is air supply system with purifying, storage and alarms



110-kv line, left, and 60-kv bundled conductor line, right, have equal capability. 60-kv line can be converted to 110-kv

Sierra Pacific Power Co. engineers solve a power transfer problem economically with . . .

Bundled Conductors at 60 Kv

By the use of twin conductors per phase on a 60-kv line Sierra Pacific Power Co. constructed a line with substantial capacity and provided for its future conversion to 110 kv. Although the use of bundled conductors has become most popular at extra-high voltages, this installation indicates that twin conductors may also find application at the lower transmission voltages.

Flexible

In this case a short haul was involved in which it was desired to construct a 60-kv line that would approach the performance of an existing 110-kv line, and to provide a 60-kv capability of about 60,000 kva on a single circuit. It was also desired to provide structures for possible future conversion to 110 kv.

Lower Reactance

Construction experience, and three winters of operation in the Sierra foothills, confirms the conclusion that bundle conductors were a suitable answer. The fundamental behind the design was the fact that twin conductors, because of lower reactance and better heat dissipation, have substantially more capability than a single conductor of twice the cross section. Under special operating conditions this line has packed 64,000 kw.

Sierra Pacific's line was profiled for 115 kv. Wood-pole H-frame structures with cross bracing were selected. Conductors consist of two 336,400 cm all-aluminum per phase. Insulators were standard suspension type, consisting of four 10-in. units for initial 60-kv operation. Standard suspension clamps were utilized with a special spacer strap designed by Pinco to provide 18-in. separation between upper and lower wires of the assembly. Hardware was designed to provide for this or other applications in which the addition

of conductors to an existing line might be considered.

Added Advantages

The impact of this practical high-capacity bundle conductor installation asks a question. Where greater power transfer is needed, isn't the addition of a second conductor a reasonable alternative to higher voltage, which often results in extensive rebuilding and costly change-out of terminal equipment? In addition, the nature of bundle-conductor installations promises reduced corona and radio interference as side benefits.

In keeping with this philosophy, Sierra Pacific has converted all of its double circuit 23-kv pole lines in the city of Reno to single twin-conductor circuits, without much sacrifice of integrity. This has released several terminal positions for use on new circuits. In addition, they are considering additional duplex circuits at voltages below 60 kv to take advantage of the economies possible when a given amount of power can be transferred at existing voltage levels and by use of existing or less expensive terminal equipment.

No Installation Problems

The installation contractor reports no particular problems resulting from the use of duplex conductors. The top conductors were pulled in on sheaves and sagged, and secured in the suspension clamps. The lower conductors were then sagged to conform with the upper conductor, and left to stabilize overnight. On the following day, spacing measurements were checked and the line was justified to plans.

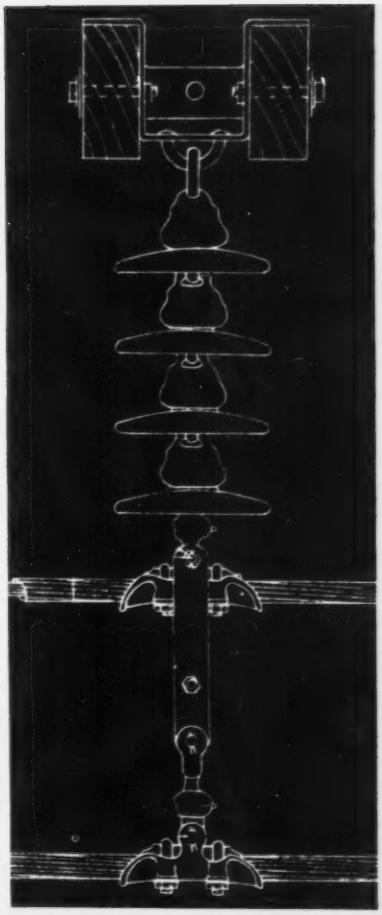
Operating Experience

Operating experience has been excellent. In an area of moderate wind and ice loading, no outages have been experienced after three winters. In the same area, seven telephone poles have snapped above the ground as a result of ice and wind loadings.

Sierra Pacific engineers are aware that they are taking a route that opposes the industry trend to ever higher voltages. They have proceeded with care and thoughtfulness and have achieved success. Courage is still the priceless ingredient in engineering.

Why Bundled Conductors Make Sense

	Reactance Ohms/mile
Single conductor 336,400 cm ACSR thermal capacity 530 amp	.800
Single conductor 666,600 cm ACSR thermal capacity 800 amp	.762
Bundle—18-in. spacing two 336,400 cm ACSR thermal capacity 1,060 amp	.549



Detail shows design for addition of second conductor, increase in voltage

Crews had little difficulty pulling in or sagging dual-conductor lines

Public Service of Colorado tested capacitors on a problem feeder. Now they have standardized air capacitors to prevent . . .

Primary Voltage Drop

R. L. Wardlow **J. E. Martin**
Electric Distribution Engineering Department
Public Service Co. of Colorado

A combination of switched and permanently connected capacitors has been determined by the Public Service Co. of Colorado to be a practical method of providing voltage regulation and limiting primary voltage drop between the first and last transformers on 7.96/13.8-kv distribution feeders.

Public Service has adopted 7.96/13.8 kv as a distribution voltage for serving new loads and for relieving overloaded 2.4/4.16-kv feeders in the metropolitan Denver area. Experience with 7.96/13.8-kv feeders has shown that a practical solution to limiting primary voltage drop must be provided if the fundamental advantage of higher voltage feeders—their capability of serving large loads spread over large areas—is to be realized. To evaluate several proposed solutions, a heavily loaded feeder serving a large area was selected for analysis and study, and ultimately for field tests of the most promising solution.

This feeder was originally installed as a 13.8-kv delta subtransmission circuit for supplying 13.8-4.16-kv substations from a 115-13.8-kv transmission substation. Although a neutral has been provided at its source, it still serves three of these substations along with substantial 7.96/13.8-kv wye distribution load. The main circuit of this feeder, which is of 4/0 copper or its aluminum equivalent, can be tied through normally open field switches to adjacent feeders. Distribution is served by numerous laterals tapped to the main circuit of the feeder.

The only regulation available is bus regulation provided by the automatic tap changing device on the 115-13.8-kv substation transformer. This device is set to hold a flat bus voltage of 13,800 v, as distribution transformers located close to the substation preclude the use of compensation to improve feeder remote end voltages.

As a means of living with normal feeder drop, the use of distribution transformer taps to compensate for primary voltage drop between first and last transformers was investigated. It was hoped that a relationship between distribution transformer taps and the line distance from the substation could be established so that a plan for standardizing taps by zones could be developed. Studies soon showed that setting taps on a zone basis alone could not give satisfactory results. Also, it was recognized that customers remote to the substation would receive a greater voltage variation than was desirable as a result of changes in primary feeder drop between light and heavy load conditions. Using taps would require that the taps on a transformer be changed each time it was moved from one location to another and would require that the tap setting be checked on each transformer installed.

If the system could be designed so that the 7,600-v tap setting would be proper for all transformers, then these changes and checks could be eliminated. Also, as 7,600-120-v distribution transformers without taps are available at a lower price, it would be possible to take advantage of these savings.

600-kvar switched capacitors installed

Regulators or Capacitors?

It appeared that primary voltage drop could be limited to reasonable values by installing either line-type voltage regulators or a combination of permanently connected and automatically switched capacitors. Although the investment required to provide sufficient voltage improvement was greater for capacitors than regulators, it was decided that the additional benefits of capacitors, such as the reduction of losses and the release of system capacity, justified the higher investment.

Capacitors were particularly attractive as they would automatically function to improve voltage during emergency conditions, even though line currents might be flowing in a reverse direction as loads were being supplied from adjacent feeders through field ties. As the voltage rise produced by capacitors is proportional to reactance back to the source, more voltage correction is obtained at a time when it is most needed if the reactance of the emergency supply line exceeds that of the preferred line.

Preliminary tests on this feeder determined that the load varied from a minimum of 2,700 kva to a

maximum of 11,400 kva with reactive components of 2,000 kvar and 5,600 kvar respectively. Calculations showed that 1,800 ckva would hold flat voltage on the feeder from first to last transformer during light-load periods, and that 5,400 ckva would be required to raise the primary voltage at the end of the feeder to 120 v (on a secondary basis) during the peak-load period. Allowing the primary voltage to drop from 125 v at the first transformer to 120 v at the last transformer during peak-load conditions is considered satisfactory.

The largest standard pole mounted capacitor bank then available was 600 ckva, consisting of 12-50-ckva units. Three such banks totaling 1,800 ckva sufficed for the permanently connected banks. The balance of the required 5,400 ckva was installed in six automatically switched banks.

To secure maximum voltage improvement, it was desired to locate the banks near the ends of the feeder main. As shown by a map of the feeder (Fig. 1), these locations also placed the capacitors near the major load centers where they would be switched with the loads to adjacent feeders during emergencies.

Capacitor Locations

As all the three-phase laterals on this feeder are connected to the main through automatic single-phase sectionalizing devices, preference was given to locations along the feeder main for installing the capacitor banks. No difficulties were anticipated if the capacitor banks were to be installed behind the single-phase sectionalizing devices but it was decided to limit these installations to one in this initial program. Operation of this bank has been so successful, it is believed that, on future capacitor projects, installations should be made on laterals regardless of single-phase sectionalizing devices, if these locations are most desirable from a voltage correction standpoint.

Voltage Sensitive Controls

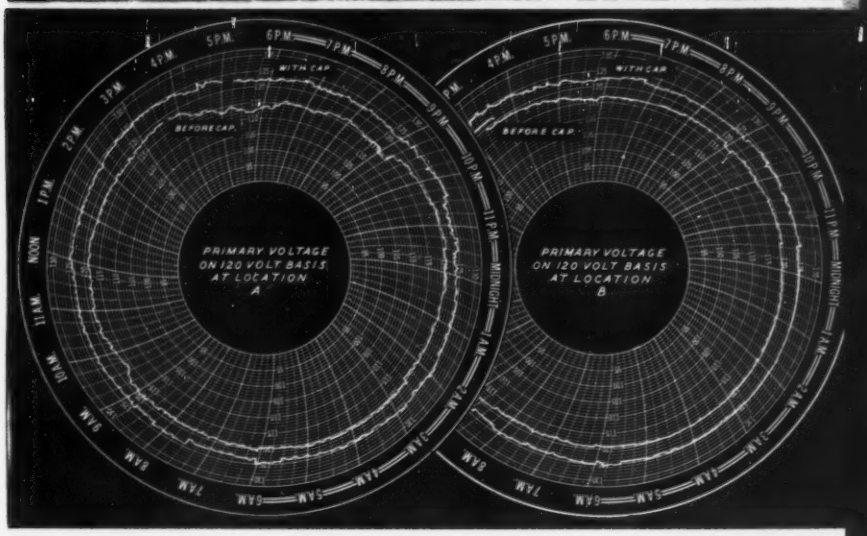
As these capacitors were being installed primarily for voltage correction, a voltage sensitive control was selected to control the switched banks. When a switched capacitor bank was to be located within a span of a present distribution transformer, this transformer was used to supply potential for the control. To prevent the control from reacting to secondary voltage drop, a potential conductor was installed between the capacitors and the transformer. As Public Service normally installs open-wire secondaries on crossarms, a duplex-type conductor was used for the potential circuit to distinguish it from the secondary. Where a distribution transformer was not available, a small transformer was installed a span from the capacitor bank for use as a potential transformer. Again the duplex conductor was used for the potential circuit to provide positive identification so that no loads would be inadvertently connected to it.

As the capacitor banks are concentrated near the ends of the feeder main, the voltage levels at adjacent banks are very nearly the same. To prevent two banks from switching at the same time, or worse yet from hunting, controls with 60-second time delays were used for the banks desired to switch first, and 120-second time delays were used for the others. In general, the 60-second time delays were used for the remotest banks where the voltage would drop to the lower limit first as load increased on the feeder.

Before the capacitor banks were energized, recording voltmeters were installed at each of the switched capacitor banks and at the substation. Also, a recording kw-kvar meter was installed at the substation. These meters provided data showing conditions on the feeder before correction and confirmed that voltage rises obtained with the banks were as calculated.

To secure the best voltage regulation, the band width setting of the voltage sensitive controls should be as small as possible. However, too small a band width could result in excessive switching requiring increased maintenance of the oil switches. A 4-v band width was selected with the upper limit set at 126½ v and lower limit at 122½ v. These setting were made on the controls with the aid of a variable ratio transformer and an indicating voltmeter.

The installation of capacitors on this feeder has improved its voltage as planned. Before and after voltmeter charts show the improved voltage regulation and level on the feeder at the points marked A and B on the one line. Voltage variation between light- and peak-load periods at location A, which is near the end of the feeder, has been reduced from 9 to 4 v on a 120-v basis and the general voltage level has been raised 5 v. The feeder now operates at unity power factor during peak load as compared with a power factor of 88% without capacitors.


WITH CAP.
BEFORE CAP.
PRIMARY VOLTAGE ON 120 VOLT BASIS AT LOCATION A
PRIMARY VOLTAGE ON 120 VOLT BASIS AT LOCATION B
NOON
MIDNIGHT

Voltage results of 5,400-kvar fixed and switched capacitor program on test feeder

One line of 10,000-kva test feeder

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Grounding Transformers—II

How to Get to Ground

Tom Hughes
Electrical Safety Engineer
California Division of Industrial Safety

Because we are dealing with three-phase emf (electromotive force) we have a ready-made solution of our problem. We can place two windings of different phase relation on the same iron core and arrange their connections so that their steady-state magnetic fields buck each other. Thus, in normal operation, all the current that can flow to the Star point (in supplying a balanced three-phase load) will be the charging current to maintain these two opposing magnetic fields in the same core leg.

From now on we are going to run into several "ifs and buts" that must affect our choices or decisions. So keep an open mind and don't lose track of these influencing factors. Notice that we stipulated "on a balanced load." Naturally, any unbalance will flow through the paths of a grounding transformer in the same manner as a fault ground current does.

Fig. 2 is a geometric representation of the winding of a three- phase, Wye-Delta, power transformer connected to operate as a grounding transformer. The Wye-connected coils are applied across the line to act as the primary of a normal three-phase transformer but the secondary windings are just connected in a closed series circuit, to accommodate any induced emf as a circulating current. Since one winding of the Delta is on each core leg of the transformer with a winding of the Wye, we have the normal relation of a three-phase transformer (be it a step-up or step-down application).

At no load, an equal and opposite emf (the back-emf) bucks the build-up of current in the primary so that only the "charging current" is admitted, to take care of transformer losses. The arrows drawn alongside the windings in Fig. 2 represent the direction of flow during steady-state three-phase conditions.

To see what happens in this system when a fault ground occurs on one phase, we have drawn a simpler representation of the system in Fig. 3. We have deliberately left out the secondary (Delta) winding of the grounding transformer and the normal three-phase load, in order not to complicate the picture.

A fault ground has occurred at X. We have pictured it on the line side of the grounding transformer but the arrows would still take the same paths if we drew it on a phase wire to the load, beyond.

The dotted line between the two ground symbols represents the side path of fault current. The solid arrows represent the first inrush of fault current as the fault develops. It is obvious that this flow must be handled mainly by two windings of each transformer, along with the steady-state load that is tied to all three windings of the main transformer.

This is where the circulating current in the closed-Delta secondary winding of the grounding transformer comes into play. As the heavy fault current builds up in the primary (cross-the-line) windings, Nos. 1 and 2, a heavy circulating current is induced in the secondary windings on these two iron-core legs.

Since this unusually large circulating current has to flow through all three secondary windings (of the closed Delta) the secondary winding on the core leg with the Wye winding No. 3 is going to induce a like current in it and this is represented by the broken (dashed) arrow, No. 3.

We see that the major portion of this induced current is going to follow the circuit of the fault between "grounds" but some of it is going to assume the burden of the normal load, as indicated by the dashed arrows numbered three prime. Remember that the solid arrows (indicating current passing through two windings of the main transformer) represent single-phase, abnormal current. At the same time, the normal load currents are trying to develop in their regular three-phase sequence.

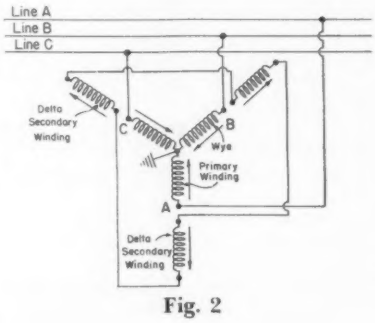


Fig. 2

In the words of transmission and transformation experts, the normal three-phase load currents developed in the line or transformer windings are said to be in positive sequence or negative sequence, depending on the trigonometric direction of rotation. These relations are affected by the nature of the load; whether inductive, purely resistive or capacitive.

The only reason we bring this up is that literature, dealing with grounding transformers, often uses the phrase: "Zero Sequence current." The zero sequence current is the abnormal current that is accommodated by all three windings, regardless of their normal phase relation, when a fault to ground occurs. As indicated by our solid arrows, this zero sequence current flows toward the fault, in all windings, regardless of their normal phase relation.

But there are two things we want to get quite clear about the functioning of this grounding transformer before we go on. One: it forces the zero sequence current to divide three ways through its windings. Thus windings 1 and 2 only have to carry a third of this fault current instead of one half, as would seem apparent by the solid arrows.

And second: it reacts to balance the neutral displacement which would occur at the load if unbalance indicated by the solid arrows were allowed to persist. If properly applied, it helps to stabilize transient aberrations of the main transformer.

As we mentioned before, the power factor of the connected load is going to affect the characteristics of the main transformer. Suppose, for example, that there were no grounding transformer connected across the Delta secondary of the main transformer and that the Wye-

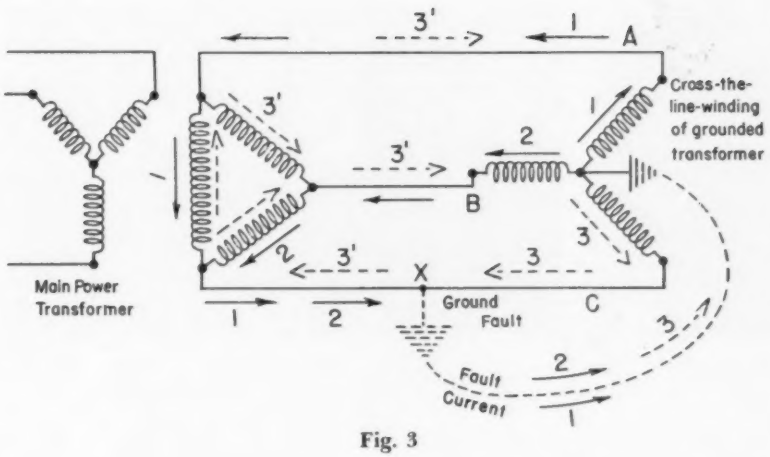


Fig. 3

connected load shown in Fig. 3 were a large motor (causing a lagging factor). When the initial wave front of the fault current hits the main transformer, the line voltage can recede to critically low values (momentarily) and mess up the operation of solenoid valves and other control devices on the system.

On the other hand, if there were no inductive load and the fault occurred at the end of an extremely long run of feeder in conduit (introducing the condenser capacity between the conductors and their containing conduit) a resulting leading power factor might cause a momentary voltage surge that could burn out lights or cause other damage to loads.

When a steep wave front hits a transformer it does not pass through the winding evenly. Depending on the impedance (reactance) of the transformer, the coils nearest the terminals will be forced to assume more than their share of the voltage wave. In the cast of a Delta secondary we have not only this transient aberration within the windings but the added fact that zero sequence current favors the two windings adjoining the affected phase (as shown in Fig. 3).

(Next article in this series will be "Zigzag Transformers.")

What About Panelboards?

Chester H. Hefner, San Mateo County Electrical Inspector

Interchangeable circuit breakers and panelboards to accommodate them is a hot subject before the code committees of the International Association of Electrical Inspectors at the present time. Requests have been made from several chapters for code revision and limitation of interchangeability. It is a timely subject and concerns the safety of electrical installations.

A little airing of the pro and con ideas should be interesting and I would like to start the ball rolling. The first thing I want to make clear is that this is a personal opinion of a problem from an inspector's viewpoint. I intend to express my opinion and expect anyone with a different opinion to do likewise. Therefore, I expect rebuttals and, in fact, welcome them so that both sides can be heard. In such a way something constructive will result.

First, I feel that the capacity of bus bars should be determined by the *total possible loads on all branch circuits.* If there exists the facility to increase the branch circuit capacity by interchangeable breakers, then additional bus capacity should be provided.

Second, I feel that when a 15-amp breaker on a lighting and appliance panelboard is replaced with a 20-, 30-, 40- or 50-amp breaker the Underwriters' Laboratories' approval is voided. I base this opinion on UL Standard 67 (panelboards), par. 46.

This to me is very clear. As I understand it, the bus bar capacity is dependent on a 15-amp branch circuit having an assumed average load current of 10 amp. I also feel that spacing control would be voided for No. 10, No. 8 and No. 6 wires would then be used instead of No. 12 conductors for which the panel was designed (par. 90).

The matter of proper size terminals for various sizes of conductors would also enter at this point. However, this is a secondary consideration and I base my argument primarily on the first part of this paragraph. As further reference I recommend looking at tables A, B, C and D, par. 47.

Third, I do not see how par. 10a can be of any value when it would be impossible to determine at the factory what the ultimate combination of breakers and/or branch circuits would be in the field. By using single-pole breakers of various sizes an unbalanced loading could very conceivably make it very difficult to determine the size of the neutral bus bar.

Therefore, I feel that a possible position of safety for the inspector might be to require a fused switch or breaker, with the proper overcurrent protection, ahead of the panel in all cases to assure a maximum loading of the bus bars.

Other Factors Not Discussed

There are many other factors, such as conductor size on feeders, etc., which could become critical in many an installation but I have not gone into this here. I want to restrict discussion to panelboards. If enough interest is shown we could go into a discussion of these other facets of the problem in another article.

Those of opposite opinions will surely want to express them. They should be afforded an opportunity to do a little research before any more facts are brought forth on this subject.

Lowe, Sierra Pacific; Tracy, Sierra Pacific; Guibara, Kaiser A&C; Allen, Heald College; Ryals, K. M. Ryals Co.

Hartley, PCEA; Drake, So. Calif. Edison

PCEA Engineers Have Workshop

At the first day's luncheon Dr. Joseph Kaplan, chairman, U. S. National Committee, IGY, spoke on the subject of the International Geophysical Year. Dr. Kaplan endeavored to bring the many aspects of the Geophysical Year study program to the attention of the group, since overmuch attention has been given to the satellite phase of the program. Aside from broadening the scope of the Geophysical Year activities, he pointed to some of the important contributions that can come from this type of international scientific cooperation.

The second day's luncheon meeting, chaired by Bob Brinton, Pacific Gas and Electric Co., featured ELECTRICAL WEST's C. W. "Brodie" Leihy on the subject "Is An Electric Utility Career Worthwhile?" Speaking for the scientific and technical fields, he indicated that a utility career offers financial returns equal to the average of American industry. In addition, it offers better than average working conditions and, today, an unusual opportunity for rapid advancement into the management brackets.

The meeting's only general session, presided over by Pacific Gas and Electric's Ira W. Collins, featured a panel of experts discussing the state of the atomic energy art.

W. E. Parkins, chief of engineering, Atomics International, Canoga Park, Calif., presented the group with the status of sodium graphite and organic moderated reactors. In line with his company's work with sodium graphite reactors, Parkins explained the program for the Consumers' Public Power District 75,000-kw station, which will begin operation as a coal-fired station in 1961 but will be converted to nuclear operation by mid-1962.

A. L. Bethel, Westinghouse Electric Corp., explained the extensive testings that enabled the Shippingport reactor to reach full power only three weeks after it first went critical. The reason for this rapid progress was the result of a test program, beginning in April 1957, which checked component by component and system by system — over 150 separate operational tests to assure satisfactory and safe operation.

General Electric Co.'s Dr. W. K. Woods, manager of nuclear materials at the G-E Vallecitos laboratory, Pleasanton, discussed the broad scope of experimental activities being undertaken at the Vallecitos laboratory. He stressed the value of Vallecitos as a tool to obtain information for future designs. Looking ahead, Dr. Woods pointed out that there was still a very limited experience with forced circulation, or dual-cycle operation, that long-time experience with Dresden-type fuel rods was limited and that as yet his group has not had experience with a fuel-element rupture.

Transportation

Sponsor: C. L. Gallup, California Electric Power Co.

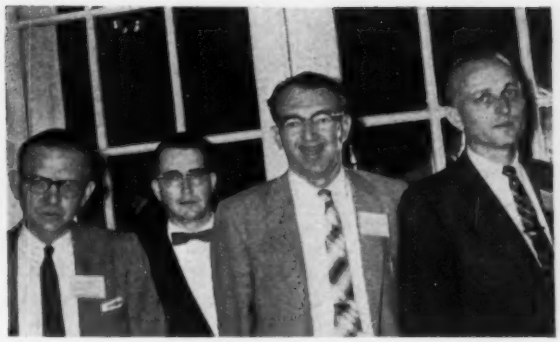
N. J. McKenzie, Southern California Edison, headed up a round-table discussion, discussing the means for compensating employees for the use of their cars for company use. A majority of payment was on the basis of per-mile compensation, but the details varied from company to company.

The many variables available to transportation management as it selects equipment for the many utility jobs were reviewed by Ray Golden, Arizona Public Service, and D. K. Madison, San Diego Gas & Electric. Madison concluded, "Our job remains the same — to select the vehicle components for the job intended to achieve the best possible results."

Pacific Telephone & Telegraph Co.'s H. B. Lowden discussed his company's driver training course, which in the past 10 years has given a 58% reduction in accident frequency rate, and has also increased gasoline mileage and reduced repair costs to tires and vehicles. The key ingredient of this training course is the use of sound human relations procedures to change an individual's attitude toward motor vehicle safety.

A panel made up of G. P. Larson, PG and E, N. J. McKenzie, Southern California Edison, and C. L. Gallup, California Electric Power, discussed vehicle replacement programs. Larson described PG and E's program as not being a rigid age replacement one, but rather a "no major overhaul" program which has materially reduced the cost per mile.

Looking at the subject of automotive preventive maintenance practices, R. S. Baird, General Telephone



Bowen San Diego G&E | **Gallup** Calectric | **Gibson** So. Nev. Power | **Davis** San Diego G&E

Kimball G-E | **Drake** So. Calif. Edison | **Ridgway** G-E | **Dent** Westinghouse | **Collins** PG and E

Co. of California, stated, "Remember, the equipment you operate is continually changing in design, performance and efficiency. Keep your maintenance operations as up to date as the equipments you maintain."

D. W. Ferguson, Pacific Gas and Electric Co., held a round table which reviewed utility companies' current maintenance practices. One organization indicated that it had a dynamometer and was receiving very favorable results. Others in the group mentioned tune-up equipment.

In an additional look at driver training programs and the training of equipment operators, Glenn Merritt, PG and E, and W. H. Brown, Southern California Edison, explained their companies' programs. Speaking for PG and E, Merritt indicated, "There has been a reduction of approximately 40% in the frequency rate of avoidable automobile accidents occurring on the systems."

Leigh Abell, PG and E, brought into focus the problems that have come about by the introduction of 12-v automotive electrical systems, whereas many trailers and auxiliary equipment are equipped for 6-v only.

In the final session, Ray Golden held a round table covering a variety of transportation problems. Main point of interest was the establishing of an uniform PCEA approach so that various member companies could compare automotive maintenance efficiencies, such as the ratio of mechanics to vehicles.

System Operations

Sponsor: W. A. Davis, San Diego Gas & Electric Co.

In a two-hour joint meeting covering the design and operation of steam plants for operation under emergency conditions, the System Operations group and the Steam Generation and Engineering Design groups heard a well-qualified panel cover various phases of the subject. J. H. Goodell, Bechtel Corp., commented on the over-all design considerations and indicated that at least one utility was committed to install a precipitator at a new station as soon as a satisfactory device was developed.

Worthington's Igor Karassik discussed the operation of pumps under the conditions of reduced voltage and frequency. He pointed out that voltage fluctuations are more important to consider because they can be present without frequency variations, but frequency variations are usually accompanied by voltage variations.

Westinghouse's G. B. Rathbun, discussing auxiliary motor operation under emergency conditions, indicated that in many cases the motors can take overheating without serious damage.

Contributing their thoughts on operating experience, J. L. Cohon and R. A. Johnson of Southern California Edison reported on some underspeed and undervoltage tests, which indicated that their existing units could recover under full load conditions from a voltage dip of 70% normal for 15-second duration. These tests have been helpful in the design of the new Huntington Beach station and in predicting the performance of reheat units during system disturbances.

Arizona Public Service's Charles Bartson related his company's experiences in coping with emergency conditions.

The subject of energizing new substations and equipment was treated by a panel including K. L. Andrews, California Electric Power, R. W. Ganzer, San Diego Gas & Electric, and C. H. Sedam, Pacific Gas and Electric. The discussion showed how the various companies coordinated engineering, construction and operating departments to bring about safe energizing and testing procedures, as well as final loadings.

Southern California Edison's Dave Hodges and A. Klopfenstein covered the experience of their company in treating bushings in areas of fog or industrial contamination with a silicone dielectric compound in an effort to cut down on the period between insulator washings.

Three speakers, C. E. Postel, Southern California Edison, C. K. Grant, California Electric Power, and Earl Whiteley, Pacific Gas and Electric, discussed the relaying limitations imposed by system design.

Lloyd Flanigan, California Electric Power Co., discussed some operating problems that come about as a result of loss of load diversity on the distribution system. Flanigan presented some means of overcoming this difficulty, and then cleverly threw the meeting open to discussion. Lively comments by Arizona's Reinhold, Davis from San Diego, and Arthur Scott, San Francisco, added construction ideas to the paper.

Hydro Generation

Sponsor: M. L. Dickinson, Bechtel Corp.

Southern California Edison's H. A. Barber, reporting on the various factors that cause deterioration in concrete, concluded that each location must be given individual treatment depending on cost and exposure. Of equal importance is a program of test and inspection, which facilitates the scheduling of maintenance repairs before a major corrective program is necessary.

Looking at the questionable hydro site, A. R. Klann, manager of sales, hydraulic section, Allis-Chalmers Co., presented suggestions that may reduce hydro equipment costs to the

Woods G-E | **Bess** Chronicle | **Parkins** Atomics International | **Bethel** Westinghouse

extent where they would become economically feasible.

J. Fisch, chief consulting engineer, S. Morgan Smith Co., discussed design considerations affecting the sectionalizing of turbine components. Properly sectionalized components reduce field costs and erection time. Fisch also commented on his company's use of T1 steel in turbine design.

H. K. Pratt, Bechtel Corp., presented a carefully documented paper on the feasibility of pump storage. His paper covered the place of pump storage on a typical large utility system, the economics involved, as well as some characteristic equipment and site arrangements. In his conclusion he stated . . . "It appears likely that many utilities can profitably incorporate in their present system a substantial amount of pump hydroelectric storage development."

In view of the marked trend to unattended hydro stations, A. B. Christie, Southern California Edison, F. I. Lawson, PG and E, and J. V. Kresser, Westinghouse, each treated the subject, "Design for Automatic or Semiautomatic Operation of Hydroelectric Plants." The speakers covered both protective and control devices, as well as the supervisory and telemetering communication equipment.

Southern California Edison's A. Klopfenstein reported on a mobile dynamics laboratory that his company has in use. The installation of an aerial load frequency control system for the economic control of generating plants has prompted a study of the sensitivity of generators to changes in frequency, and the response of the generation control equipment to signals from the aerial load frequency control system.

In a joint presentation, C. M. Buck, C. E. Altman and G. W. DeGottardi, all of Pacific Gas and Electric Co., discussed their experiences with high-voltage d-c testing of a-c machines. They pointed out that d-c testing is a useful aid to predict probable equipment reliability and to program maintenance operations.

Discussing operation and maintenance problems with vertical shaft multijet impulse wheels, H. L. Sherwood, PG and E, and P. B. Dawson of the Pelton Division of Baldwin-Lima-Hamilton Co. concluded that operating experience on this type of turbine was satisfactory. While there appears to be additional deterioration, the inspection and maintenance of runners of vertical machines have proved to be more convenient than on horizontal machines.

Underground Transmission and Distribution

Sponsor: James B. Bowen, San Diego Gas & Electric Co.

R. C. Blankenburg, Southern California Edison, reviewed the many factors that influence the total cost of underground transmission cable, such as purchase price, cost of installation, cost of maintenance and operation, as well as service reliability and over-all useful life.

San Diego Gas & Electric's Jim Bowen headed a panel consisting of Carter Blankenburg, Southern California Edison, C. B. Anderson, California Electric Power, and E. E. Neher, Pacific Gas and Electric, to discuss the engineer's dilemma—paperwork. The group exchanged ideas on the records maintained by their groups, with an eye toward the elimination of any records that are not absolutely necessary.

PG and E's Ken Dorking told the group of the new techniques developed for the installation of a new 110-kv cable circuit (see ELECTRICAL WEST, January 1958, p 78, for more details).

R. J. Wiseman of the Okonite Cable Co. brought the group up to date on the latest European developments in high-voltage cable. The group indicated considerable interest in European practices by the questions that followed the presentation.

G&W Electric Specialty Co.'s J. H. Nicholas discussed some of the design considerations in the development of equipment for termination of high-voltage, gas-filled cables.

Roy Cowles, Rogers Engineering Co., San Francisco, presented a historical survey of submarine cables, and concluded that except for external damage submarine cable properly made and properly installed should offer a service life of 30 years or more and be reasonably free of failures.

Overhead Transmission and Distribution

Sponsor: A. P. Gibson, Southern Nevada Power Co.

F. E. Cavola, Southern California Edison, reported on problems in connection with shopping centers. His talk covered the importance of preliminary planning and cooperation between the developer and the serving utility, as well as discussions of utilization voltage, distribution voltage, and underground vs overhead types of service.

Westinghouse's R. F. Lawrence, in viewing the high residential usages of the future, indicated that higher secondary voltages may save as much as 25% in investment. Lawrence indicated that the new higher voltage would be used only in new areas and did not contemplate a mass change-over.

R. E. Reinbold, Arizona Public Service, reported on the studies of air conditioning and heat pump loads in Arizona, highlighted the importance of the changes in load pattern, load factors, diversity, as well as the increase in kilowatt-hour usage, brought about by the air conditioning.

PG and E's O. L. Hill and D. C. Keezer reported on their investigations, which led them to apply series capacitors for the correction of flicker in lieu of other means that would be both difficult and costly.

Discussing joint pole design, B. L. Peter, PG and E, and I. C. Norwood Jr., Pacific Tel & Tel, reported on an experimental installation aimed at reducing costs and improving appearance of pole lines in residential areas. The design utilized fewer

Stevens So. Calif. Edison | **Breedlove** San Diego G&E | **Blecksmith** Duncan Electric | **Shattuck** PG and E

Moats Westinghouse | **Neikirk** Line Material

shorter poles of a minimum pole class and the use of extended racks rather than secondary crossarms. This type of construction represents a 20% cost reduction compared to conventional means.

Walter Beck, PG and E, told a combined group of Communications and T&D engineers that the use of electronic fault analyzers on power and communication circuits enables them to spot trouble "right down to the tower on power lines and within a few poles on communication circuits."

Westinghouse's T. J. Bliss, in a paper entitled "Extra High Voltage Transmission — Why," presented a very powerful economic case for ever higher voltages as utility companies are required to move ever larger blocks of energy. His paper gave a summary of EHV experience in this country and a short survey of the work that is being done abroad.

Substations

Sponsor: R. B. Kimball, General Electric Co.

In a paper entitled "Progressive Substation Design," T. D. White, Arizona Public Service, reported on the design standardized on by his company. The design utilizes box-type structural members, presenting a particularly clean-cut appearance. The design lends itself for expansion from 7.5 mva to 64 mva with a minimum of reconstruction. Public acceptance has been excellent, resulting in less difficulty in acquiring substation sites in residential areas.

D. J. Miller, PG and E, and Morgan Mills, Southern California Edison, reported on the field maintenance of oil circuit breakers. They reported on the problems of maintaining breakers of ever higher interrupting capacities and greater operating speeds. Proper training of personnel was held to be the key to cutting down the number of man-hours required to overhaul a breaker and to evaluate interim tests so that the period between overhauls can be increased.

The problem of restoring service in the event of a substation power transformer failure was discussed by A. O. Clark, PG and E., and C. E. Stine, Southern California Edison. The high degree of reliability of the modern power transformer seems to make the maintenance of a spare transformer in the station uneconomic. The speakers noted a trend toward area spares and the use of mobile equipment, which represents considerable economies.

D. H. Colwell, PG and E, reported on the installation testing of 110-kv air-blast circuit breakers recently installed by his company. (For more details, see p. 72.)

M. G. Mathers, manager of engineering for Federal Pacific Electric Co., discussed the design and manufacture of high-voltage bushings. He concluded that recent standardization activities have had the side effect of encouraging new designs that are reflecting superior characteristics.

Speaking in the challenging area of circuit interruption development, Glenn Bates, Westinghouse, reviewed the properties of sulphur hexafluoride that make it advantageous as a circuit interruption medium.

Following this presentation, Walter Wilson, General Electric, reviewed the development of oil circuit breakers and indicated that they have not reached any basic limitations to date. Looking ahead, he indicated that his company has been active in the development of air-blast breakers for ratings as high as 460 kv, 33,000 mva. It is his contention that air-blast equipment will be of increasing importance at the higher voltages.

Meters

Sponsor: C. C. Blecksmith, Duncan Electric Co.

The Meter group began its meeting with a series of committee reports, including an EEI Meter & Service Committee report by K. M. Stevens, Southern California Edison, the WUESSC report by Larry Bartholomew, Pacific Gas and Electric, and the PUESRCC report by E. W. Trenkle, Arizona Public Service.

A variety of points of view was discussed regarding the new class 200 meter. M. C. Robinson, PG and E, and K. M. Stevens, Southern California Edison, pointed out that the decision to go to the class 200 meter was to some extent a balance between low-current accuracy and long-term usefulness. In limited tests, Robinson indicated that the difference in reading between class 100 and class 200 meters is so small as to make the question of low-current accuracy somewhat academic.

W. D. Shattuck, PG and E, reported on his company's automatic meter testing equipment, reported to be the most highly automatic testing equipment in the West.

Burke Breedlove, San Diego Gas & Electric, led a discussion covering this form of meter testing.

Rue Seagren, PG and E, aided by A. J. Crowley, California Electric Power, and W. J. Wright, Sierra Pacific Power, turned attention to the proper design of an automotive body for the use of metermen. In utilities where trucks are assigned for metermen use, body standardization brings about some savings in purchase price and more efficiency.

Polyphased kvar metering and approaches to 277/480 metering were discussed by Breedlove and Stevens.

The meeting was brought to an end by a series of presentations by a meter manufacturer's agent.

ASEA Automatic Switch Co. ASEA

Leihy
Electrical West

Brinton
PG and E

Communications

Sponsor: W. U. Dent, Westinghouse Electric Corp.

In a joint meeting with Systems Operations, General Electric's Walter Sutter and Westinghouse Electric's G. A. Boule discussed microwave as an alternate for carrier in system protection. The speakers covered the evolution of microwave as a system protection's link and emphasized the importance of over-all system engineering — from relay to relay to obtain reliable protection. To back up the assertions that microwave is satisfactory, Sutter had recorded comments by a group of users of microwave for this application.

L. E. Ludekens, now chairman of the Operational Fixed Microwave Council, reported on the present status of FCC actions, and then treated the problem of integrating wire line carrier and microwave facilities into a system for frequency load control.

Tom Ferry, Pacific Gas and Electric, and W. H. Brown, Southern California Edison, discussed methods of simplifying installation and maintenance of two-way radios. Of particular concern were various means for converting from 12 to 6 v to make 12-v automobile systems compatible with 6-v communications equipment. The difficulties resulting from the FCC's split-frequency ruling were also covered.

New developments in electronic equipment for electric utility communications were covered by a panel of manufacturers' representatives, including Robert Peth, Motorola, Ralph W. May, General Electric Co., James G. Strickland, Automatic Electric Sales Corp., and N. E. Edwards and S. J. Combs, Radio Corp. of America. Their comments covered new developments in microwave, multiplexing and mobile equipments.

Three utility communications representatives discussed the maintenance problems and procedures encountered in their organizations. They were R. J. McKnight, Arizona Public Service, Cecil Schnarr, San Diego Gas & Electric, and Al Worthington, PG and E.

In the final meeting, Boule urged users to adhere to EIA standards for use and testing of microwave equipments. This constructive standardization, he claimed, would certainly advance the microwave art.

Engineering Design

Sponsor: Robert Milmoe, Bechtel Corp.

In addition to many joint meetings with other groups, reported under different headings, the Engineering Design Group heard John Maneatis, Pacific Gas and Electric, and D. H. Sandell, Aluminum Co. of America, discuss the design and application of welded aluminum bus. Since the introduction of inert gas arc welding, it appears that considerable economies can be effected from the use of welded aluminum bus, mainly because of the elimination of the need for fittings. Where the number of joints are sufficient to justify the use of the welding equipment, savings over conventional copper construction are appreciable.

Three related talks on the subject of coordination of steam plant protective devices were presented by Jack Barkle, Bechtel Corp., Einar Nilsson, Pacific Gas and Electric Co., and Paul Blicklen, Arizona Public Service Co. In the opening talk, Jack Barkle pointed out that steam plant protection practices were as much philosophical as they were technical. He pointed to the basic conflict between the objective of preventing equipment damage and protecting service continuity. In the subsequent talks, Nilsson and Blicklen briefly covered the practices that have developed within their companies.

Steam Generation

Sponsor: E. A. Lodge, Arizona Public Service Co.

Southern California Edison's new Huntington Beach steam station designed around two 220-mw cross compound axial flow turbine generator units, will achieve a net heat rate of 9,064 Btu per kwh, stated J. B. Moore of that company. Preliminary designs are now being developed for two additional units at Huntington Beach. The new units will feature universal pressure boilers, which introduce an entirely new concept in control and operation of such critical steam stations to this country.

San Diego Gas and Electric's C. T. Geiger told the group about his investigations into the causes of furnace puffs and the corrective measures to be taken to prevent a recurrence.

PG and E's R. D. Ramsay and H. W. Cocklin of Arizona Public Service presented their thoughts on the training of maintenance personnel for large steam plants. Cocklin pinpointed his company's training program for instrument repairmen, while Ramsay directed his comments at the development of good caliber machinists.

General Electric's Glen Warren reviewed the research and development behind today's turbine-generator, and indicated some of the areas that promise returns from continued research.

R. M. Sarver, Southern California Edison, presented actual cost figures covering four overhauls of large steam turbine-generators. Based on this material, he concludes that station crews should be sized to take care of day-to-day work, and a central organization be used on a rotating basis to overhaul the machines. He further concluded that for outlying stations contract maintenance competes favorably with company forces for unit overhauls.

A panel composed of Bruce Emory, California Electric Power, K. Campbell, San Diego Gas & Electric and Cleo Walker of Arizona Public Service covered the subject of overhaul problems and practices in steam-electric stations. Walker presented the thoughts of J. R. Ziegler of Hawaiian Electric Co., which expressed the special problems of his company, where great distance from materials and services and lack of interconnections with other utility systems placed special requirements on maintenance procedures to maintain its spinning reserve.

Here are donors, judges and winners of Electrical West awards for "most informative" exhibits at the EMEA show. From left are: Dale VanHorn, Electrical West; William Broker, judge, Gough Industries; Morton Hassler, U.S. Motors, second place; R. T. McGinnis, Automatic Switch Co.; R. J. Kernaghan, show chairman, Goodyear Tire & Rubber Co.; C. L. Dryden, Automatic Switch, first place; Stan Rejda, Epoxylite Corp., show committee; C. W. Doane, Larsen-Hogue Electric, third place; F. E. Reeves, Automatic Switch; and G. B. Mirus, Wilco Co., a judge. An estimated 7,000 visitors saw the colorful show exhibits

Education Is the Key

"Educational" might be the single word that best describes the Electrical Industry Show and Electrical Maintenance Conference held March 27-29 in Los Angeles. The Electrical Maintenance Engineers Association of Southern California put forth every effort to make this one the best. "Educational" is descriptive because manufacturers' exhibits were judged on the basis of "most informative," and conference subjects were definitely most informative.

Plant lighting, power factor improvement, maintenance of electronic equipment, safety and the maintenance of various manufacturing processes and equipment were among the subjects that were discussed by speakers and by those attending the conference.

The conference itself drew 217 registrants and the exhibit area attracted an estimated 7,000 engineers, electricians, maintenance personnel, purchasing agents, electrical industry executives and others. Robert J. Kernaghan was general chairman of the show, with Fred Tabery serving as exhibit manager, and Paul H. Henrichs, Southern California Edison Co., serving as conference chairman.

Lighting

An interesting and very thorough experiment with industrial plant lighting was described by Frank S. Miller, head of the department of plant facilities, Grayson Control Division, Robertshaw Fulton Controls Co. In new plant facilities that had been equipped with actual maintained lighting of more than 60 foot-candles, Miller deliberately set up a program of no maintenance on light fixtures, but began maintaining close records on lighting levels and production index. At the end of one year of continuous operation, the average foot-candle power had dropped to 55. At the end of two years it had dropped to 48, and at the end of 2½ years, the level was at 35 f-c. It was at this point that Miller's department began receiving complaints about poor lighting.

The companion study of the relation to lighting to production standards was described by Miller as being "most controversial." To measure this, Miller's group averaged out the monthly production index for the first year and called it 100%. Because the plant was new and the lighting was at the plan-to-maintain level of 60 f-c, that, too, was called 100%. Tracing the fall-off of both production and the light level graphically showed that the two were in direct relationship to each other. The trend continued through the three years that the tests were conducted. When the entire plant was relamped at the end of 1956, a change was made from cool white to a standard warm white to gain additional lumens. The foot-candle level then jumped to 90, or approximately 150% of the initial standard, and the production index jumped to slightly over the original 100% and remained above that level for the entire year of 1957. To Miller's company this proved that maintenance of a high lighting level was definitely worth-while.

Further tracing the economics of lighting practices and maintenance, Miller illustrated with impressive dollar calculations that continuous operation of the lamps was far more economical than frequent turning on or off. Panel discussions on maintaining proper standards of lighting, modern industrial lighting design and outdoor lighting brought out more technical confirmation of Miller's findings.

Participating were Joe Platt, district manager and engineer, Holophane Co. Inc., A. L. Pryor, South-

Though 1958 show was "outstanding," 1960 is expected to be even "bigger and better"

ern California Edison Co., and Miller. Urban Beh, a consulting engineer, was chairman of the group.

Electronic Equipment

The word "education" comes up again in summarizing the papers devoted to maintenance of electronic equipment. Education and experience were presented as the first requirements. Proper maintenance must be done by an electrician or an engineer with electronic education, and it is necessary to have the proper test equipment. "A wet finger will not do." Electronics maintenance, just as most other types, requires a proper trouble-shooting technique.

Then comes the problem: does the electrician understand the fundamentals of direct current or of electronic circuits? Experiences of Chairman K. Lee Alvey, Airesearch Mfg. Co., and speakers George W. Haven, Electronic Maintenance Co., and E. O. Reed, General Electric Co., indicate that too often the electrician is not educated for electronic maintenance. This is primarily true because the fundamentals of electronics cannot be learned on the job. Some type of formal electronic education is required. It is available through correspondence courses, adult education courses or by company-sponsored courses. This is the way to begin an electronic maintenance program: train the personnel.

Presented as an example of electronic education is the program of the Southern California Chapter of EMEA, which encouraged members to enroll in a program of industrial electronics at Los Angeles Trade-Tech Junior College. Today, 16 men are finishing the fourth and last semester of the program.

Power Factor

Chairman of the group, "High Power Factor Can Pay Big Dividends," was William H. Warren Jr., area power engineer, Southern California Edison Co. His panel members were J. F. Miller, application engineer, General Electric Co.; Carroll M. Cole, engineer of customer equipment service, Los Angeles Department of Water & Power; Milton A. Brenner, Brenner-Fiedler & Associates; and Phil A. Belsky, distribution system engineer, Westinghouse Electric Corp.

Safety

These rules for electrical safety in plants were presented by E. E. Carlton, supervising electrical safety engineer, Division of Industrial Safety, Department of Industrial Relations for the State of California. He said, "Inferior equipment should never be used, because of the hazards that may develop from defective material or workmanship.

"The second step is to make sure that the equipment is properly installed and maintained.

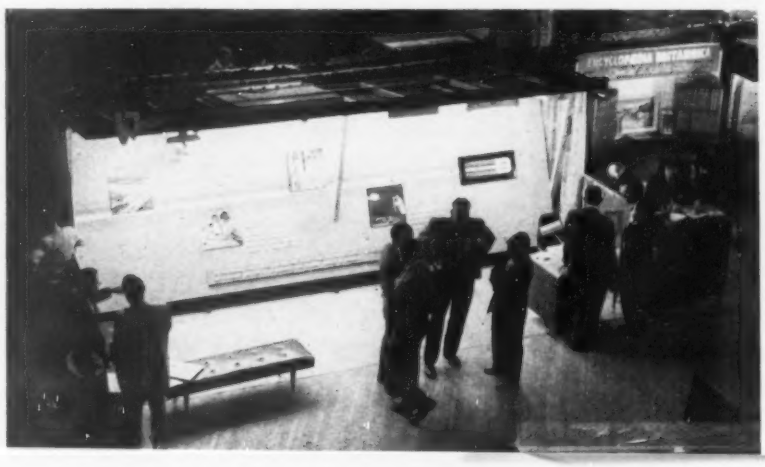
"The third step is the exercise of caution and common sense by persons working on or near electrical equipment.

"The remedy to the electrical injury problem lies in the observance and *application* of time-tested safety rules and practices."

These are only a few of the subjects explored in the conference, and the summaries do not adequately illustrate the general atmosphere of education and interest that prevailed. Actually, subjects such as maintenance of adjustable speed drive systems, maintenance of electrical insulation on rotating machinery, how to estimate additions and expansions, and the selection and maintenance of protective devices proved to be equally attractive.

On the exhibit floor, three members of the public relations committee of the Purchasing Agents Assn. of Los Angeles strolled about making observations that would lead to the difficult decision as to which displays were "most informative." They were: William Broker, Gough Industries, F. M. Knight, and G. B. Mirus, Wilco Co.

Their selections for the ELECTRICAL WEST award were: first place, Automatic Switch Co.; second place, U. S. Electrical Motors Inc.; and third place, Larsen-Hogue Electric.



Newest company on hand was Lighting Dynamics

Nelson

Jones Whaley Norwood Pease

NWPPA Discusses Improvement

The Northwest Public Power Assn. 1958 Engineering and Operating Workshop program was oriented in the direction of improved operating and maintenance practices.

Even as Julian Whaley, committee chairman, Seattle City Light, introduced the first speaker, Thomas Nelson of Rogers, Slade & Hill, it was apparent that the group recognized that utilities operate successfully because of people. In his talk, "Management Is The Development Of People," Nelson attacked the idea that management learning must come by experience. He smiled, "It's experience that gives most of us our bad habits. We can learn much through the experience of others."

Don Jones, Clark County PUD, introduced Craig Elliott, Mason County PUD No. 3, who developed the idea that the so-called "expensive" aerial manlift equipments now available are so productive that utility management should encourage their use. One piece of equipment receives such heavy use on his system that after keeping careful records of the cost and utilization for a five-year period, it was found that the cost of this very expensive equipment was $2.35 per hour.

Standing in for Tom Hall, Perry Newport, Halline Equipment Co., indicated that the cooperative development of equipment by utility operating people and equipment manufacturers would make the utility construction equipment of tomorrow nearly unbelievable by today's standards.

Meter and Relay Section

R. L. Paysse, Chairman

Ray Paysse, Grant County PUD, introduced Jim Taugher, General Electric Co., who discussed the subject of the economics of meter testing. Without making any specific recommendations, Taugher reviewed the practices of many of the utilities in the area, both in testing new meters as well as in service testing.

Pole-top resuscitation demonstrated

Trueman T. Smith, Bonneville Power Administration, reported on the inspection and maintenance program which BPA has evolved for the meters and relays on its system. Smith likened the preventive maintenance of relays to the maintenance of oil circuit breakers and fire engines—the device lies dormant until called on to operate, and then it must go into action quickly.

Prof. John Engle concluded the Meter and Relay session with a report on the continued success of the meter school conducted at Oregon State College.

Communications Section

W. B. Miller, Chairman

W. B. Miller, Tacoma City Light, opened the afternoon session by introducing R. A. Benson, Seattle City Light, who discussed with the group the present status of the pending FCC dockets relating to the use of radio and the power radio service.

John Scofield, Eugene Water & Electric Board, pointed out in a talk the advantage of replacing mobile radio equipment when it has become technically obsolescent rather than waiting for the formal economic obsolescence to take place.

Bob Mathews, Douglas County Electric Cooperative, told the group how a recent change in FCC Rule 11.253 now allows the use of mobile frequencies for the operation of an unattended transmitter. In the event of an outage or equipment operation the device sends a coded signal to the base station indicating an operation. Mathews indicated that such a device may have considerable application among smaller utilities.

Seattle City Light's D. D. Baer brought the group up to date on the present recommended radio operating procedures, and recommended strongly the use of the NCUR guide for efficient radio operating procedures.

Safety Section

John E. Schriner, Chairman

Opening the Safety Section, John E. Schriner, Central Lincoln PUD, presented a very comprehensive paper covering driver training, equipment inspection and maintenance, as well as recommended safety procedure for working on the highway.

Jack Davidson, Ruralite Services Inc., discussed the value of tail gate conferences as a means of giving proper job instruction before a job is undertaken. His appeal was, "Correct the faults before it's too late."

City of Forest Groves' Harry Sherman discussed the proper use of tools for safety. His talk was supplemented by a manufacturer's film.

James J. Sisk, Franklin County PUD N. 1, pointed out the public relations value of a safety program aimed at educating the public. Working through community groups, such as 4-H Clubs and Scouts, public information programs can gain support for safety programs.

A particularly valuable contribution to the group's understanding of some psychological barriers to safety came about as a result of James C. Conant's presentation on leadership in safety. Dr. Conant, an industrial psychologist with General Electric Co. at Richland, Wash., touched on some of the reasons why many well-conceived safety programs fail.

G. E. Tatum, Tacoma City Light, with the aid of three Clark County PUD linemen, gave a very realistic and moving demonstration of how to perform pole top resuscitation. The method used was the back-pressure, arm-lift respiration technique, which is particularly valuable for applying artificial respiration in the critical minute or two following shock.

Scharnhorst Schriner Paysse

Substation Section

R. C. Willis, Chairman

Bob Willis, Clark County PUD, opened the second day's session by introducing Don Hughes, Cowlitz County PUD. In his presentation, Hughes stated, "Each substation grounding installation will be unique, and of necessity must be designed to provide the greatest degree of reliability and safety."

Harry Wilmot, Shell Oil Co., discussed the various factors affecting transformer oil life and made some recommendations for the maintenance of transformer oil.

C. C. Diamond, Bonneville Power Administration, presented the basic ground rules of BPA's substation maintenance program, and indicated that the use of "diagnostic" maintenance improves the ability to make intelligent decisions on the need for certain more expensive maintenance tasks.

Hank Schwager, Schwager-Wood Corp., discussed the line-type interrupter switches manufactured by his company, giving particular attention to the application of the right interrupter for the required duty.

John C. Marshall, Clark County PUD, brought to the group a compilation of the trends in the design and construction of distribution substations. He indicated "the effectiveness with which the distribution substation fulfills its function is measured in terms of voltage regulation, service continuity, flexibility, efficiency and cost."

Opening his talk with the statement that "effective protection of electric distribution systems results in maximum continuity of service and efficient protection of equipment," Bob Lemman, Line Material Industries, discussed fusing practices, with a particular eye toward the coordination of sectionalizing devices, fuse links and other overcurrent protection systems.

Bob Scharnhorst, Benton REA, introduced Paul Ousley, Dan Kamphausen Co., who took a careful look at the economics of pole and crossarm maintenance. Ousley concluded that "the maintenance of pole timber in the U. S. is not so much a shortage of timber as it is the cost resulting from inflation in labor and material cost of pole replacement." He added "an extra year's life for an old pole is worth $10 to $15 by conservative calculations." Ken Lein, Cowlitz County PUD, carried on Ousley's comments by explaining his organization's pole plan maintenance procedures.

The concluding presentation was made by Allis-Chalmers' Clarence J. Roeger, covering trends in the use of distribution transformers. His paper traced the increase in the average kva, voltages and the like.

Julian C. Whaley, distribution engineer, Seattle City Light, was unanimously elected general chairman of the Engineering and Operations Section committee for the coming year, succeeding A. C. Northrup, superintendent, Franklin County PUD, Pasco, Wash. Elected vice-chairman was John E. Schofield, assistant superintendent of electrical operations, Eugene Water & Electric Board.

Ephrata, Wash., home of Grant County PUD, will host next year.

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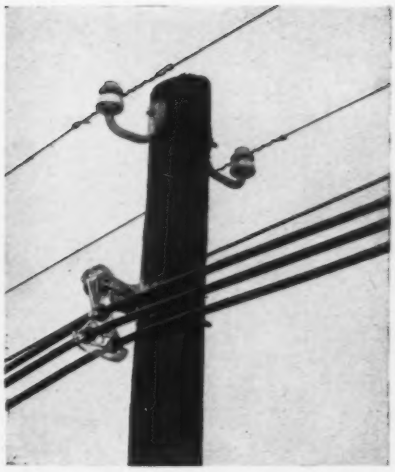

New Roebling ROEPLASTIC Cable with ROECLAMP requires only one foot of clearance through trees! Note improved, compact appearance. No crossarms are needed.

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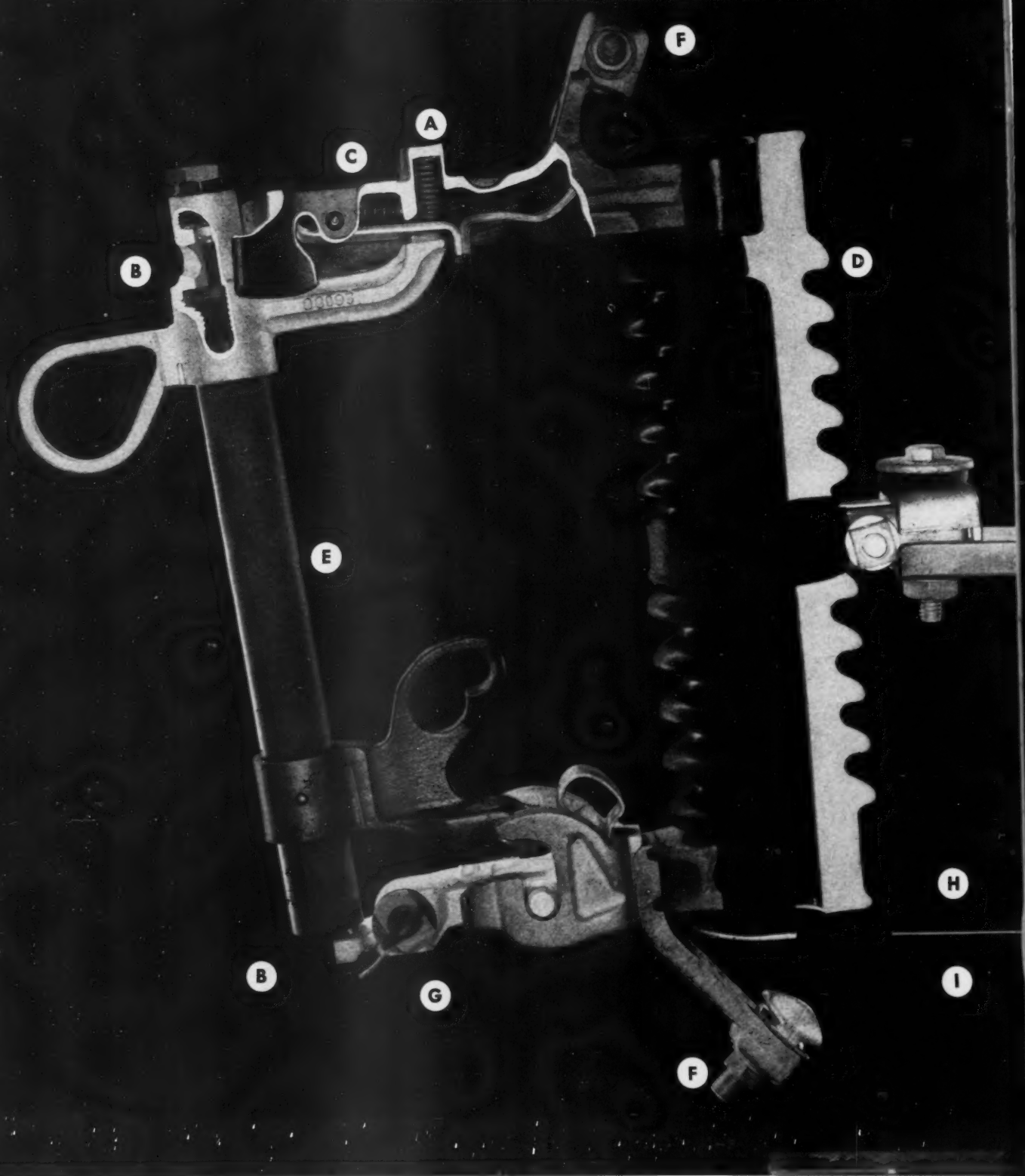

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- **G** Flipper—whip action provides 4" travel in separating blown fuse link.
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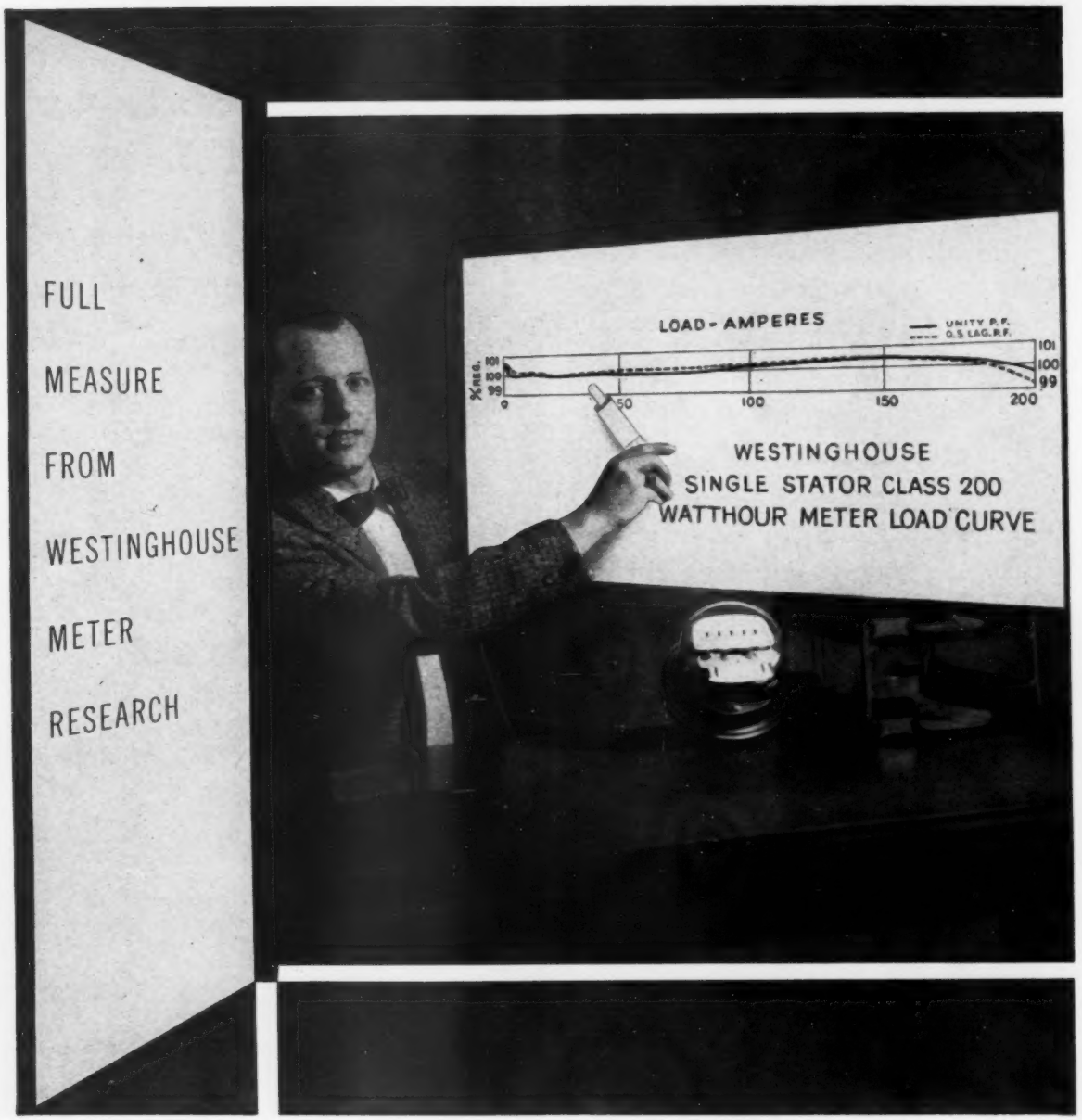

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In the photo above, Fred Mindt, Engineering Section Manager at the Westinghouse Raleigh, North Carolina, Meter Plant, points out accuracy of registration of loads as low as ½ ampere or 120 watts — which is ¼ of 1% of maximum capacity.

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When to Delegate

Dr. Joseph G. Phelan, Ph.D., Personnel Development Counselor, Bechtel Corp.

Problems of Management—V

There is an almost infallible rule that marks the time when an executive must decide to delegate more responsibility. That time is reached when it becomes necessary to stuff a brief case full of papers and take it home over the week end. When that situation develops the executive either does not have a large enough working group (in which case he has failed to sell top management on his personnel problems) or he is trying to do too much of the department's job himself (which means that he is not adept at delegating responsibility and spreading some of his work load). Nine times out of ten the latter condition is responsible for the necessity of taking the job home to the family.

Delegation, properly handled by modern executives, gets his job done more quickly, efficiently and with less mental and physical strain. Delegation is a two-edged sword because it (1) releases the executive's time for thinking and planning at the managerial level and (2) it keeps the people working under him moving in the right direction. The latter benefit merits some discussion.

Delegating responsibility to subordinates increases their job understanding in breadth and depth. It builds job interest and job satisfaction not only because good subordinates seem to thrive on varied assignments and challenging jobs but also because their stature increases with responsibility and the opportunity to exercise independent judgment. This in turn trains the subordinate to make decisions on his own, to act with authority and to become increasingly valuable both to his superior and the organization as a whole.

When to Delegate

In the last issue of ELECTRICAL WEST basic steps in methods of delegating authority were discussed. When and what to delegate likewise are important phases of the whole subject of managerial responsibilities and authority.

The decision of what and when to delegate begins with a self-appraisal by the executive. The first thing he does is to check the amount of time spent in such routine matters as making calculations, jotting down entries, checking materials and supplies, answering correspondence of a routine nature, settling arguments over the authority of subordinates and making decisions in part rather than on the whole of a given job or project. If he finds that he is spending as much as 25% of his time in tasks such as those, it is a pretty fair indication that the time is right for more delegation of responsibility.

The self-appraisal also includes a dispassionate analysis of his subordinates. Have they been trained to accept more responsibilities? If not, remedial measures are imperative and delegation of even small tasks is all part of a sound training program.

A good executive is continually re-examining his "emergency" procedures. If he is taken out of the play accidentally or if he is pulled off his job temporarily by higher authority, it is still his responsibility to see that his department can function effectively in his absence. However, the best plan ever devised will not work if it is only on paper and if subordinates have never been given an opportunity to "go it on their own." There is a vast difference between a delegation program on paper and the use of operating responsibility and authority by subordinates.

Basically an executive is expected to handle *all* of the responsibilities of his job and *do a good job* on the most important ones. When he becomes overburdened with details to the point that his important decisions are not being given adequate consideration, it is time to pass along some of the lesser responsibilities for handling by competent subordinates. Delegation is always a calculated risk because the final responsibility for the over-all job rests with the executive. Risks, however, become progressively smaller as subordinates are trained and become increasingly competent in their judgment and ability.

What to Delegate

Administrative details are the simplest and easiest tasks that can be delegated. If you are fortunate enough to have a secretary a sufficient length of time to know your habits and thinking, she can compose much of your personal correspondence that falls in the routine classification for your signature. Collecting data and compiling reports for superiors likewise can be handed over to a subordinate even though you may have to make the final analysis and dictate the report. Maintaining inventory and issuing requisitions within prescribed limits is another example of routine operations that can be delegated provided proper control procedures are instituted.

Minor departmental operations offer a fertile field for relieving the overburdened executive. Most effective results will be obtained if a whole task can be delegated as a single responsibility. For example, if complaints about electrical service are to be delegated to an individual, he should be responsible for handling *all* complaints, including the ones that his superior might get by telephone or letter from either friends or strangers. One way to approach this problem is to analyze the operation of the department and determine which tasks can be consolidated into single individual responsibilities and then select those for delegation that offer the least risk

Check Your Score on Test, Page 8

All the answers are true except 5 and 9.

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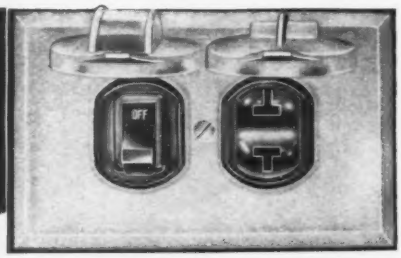

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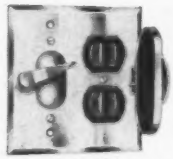

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to the over-all operation, the least amount of executive supervision and the greatest ease of effective control.

Liaison activities with other departments (committee work, etc.) is another way of freeing executive time. Competent representatives from your department can handle much of the interdepartment coordination that is essential in any large organization. The man selected to sit in on conferences and committees must be capable of making decisions and must have sufficient authority delegated to him so that he can be an active participant and not merely a reporter.

What Not to Delegate

There are certain things, too, that the executive should not delegate to subordinates. Within his own department he should be the spark plug for motivation and morale development of his subordinates. He might delegate the details of arranging a training program but his is the responsibility to see that it is received with enthusiasm and understanding by the employees.

Certain confidential matters dealing with pay, merit ratings, departmental budgetary controls and similar matters generally should rest in the hands of the department head and not be farmed out to subordinates.

Above all don't delegate over-all control of your department's operation—unless under emergency conditions. No matter how complete your delegation of authority may be, control and coordination of the individual operating entities should rest in the hands of the executive who has the final responsibility for the department's performance.

Finally, no amount of delegation can take an executive "off the hook" when a company or departmental crisis occurs. In fact, that may be the time when the executive reassumes all of the authority and responsibility in order to make fast decisions that cope with the situation. Even in noncritical times the competent executive does not hesitate to make necessary changes in assignments of responsibility and authority if his control procedures indicate that this will improve over-all departmental performance.

In summary, delegation is not easy. It's risky, and often requires the sacrifice of short-term benefits for long-term gains. However, it is an essential part of business operations and it pays dividends in making executive time more productive and in training future executives.

No. 5 in a series

Right off the Wire

An automatic ultrasonic welder makes tack welds without heat at the rate of 200 inches per minute.

Miniature mercury lamps are being used in batteries of twelve for night aerial photography. An area of sixteen square miles can be lighted from an altitude of 20,000 feet.

A new electron microscope permits the examination of opaque specimens.

An electronic converter makes any radio an appliance timer.

A three-year test of a 43,000-pound ship's propeller made of nialite (nickel-cadmium bronze) shows no wear caused by erosion or cavitation.

D. W. Kitchin and O. S. Pratt of Simplex recently made two major discoveries in studying corona spaces in cables — one, by observing internal pressure decrease, and another by mapping with silver cyanide solution.

A distillation column sixteen feet high and made entirely of glass is said to be the world's largest. It will be used to make silicon carbide with impurities of only one part in ten billion.

It has been demonstrated for the first time that petroleum is a colloidal dispersion. This knowledge may help in obtaining greater recovery from existing oil reserves.

A giant machine to hold large assemblies for welding can lift, tilt and rotate weights up to forty tons.

A tiny photoflash bulb is said to give the same amount of light as one four times its size. It uses zirconium rolled to foil gauge.

Over 1300 industrial concerns in this country are now using radioactive byproducts. About 200 were added to this list during the last year.

Air power for generators in remote installations, such as aids to air or marine navigation, can be supplied by a modern windmill which has a thirty-foot, three-bladed "propeller." It maintains constant speed.

Temperatures as high as 3500°F. are resisted by a new molded plastic.

Polyethylene is now made with an ultraviolet inhibitor and is said to last four times longer than the unprotected form.

Further information on these news items and on Simplex cable is available from any Simplex office. Please be specific in your requests.

Nuclear reactors may be used as economical sources of heat to convert coal into gaseous or liquid fuels.

A stereo cartridge to play the 45-45 Westrex groove records is in production.

South Carolina is putting its automobile drivers' licenses on photosensitive, anodized aluminum. They will be used for four years.

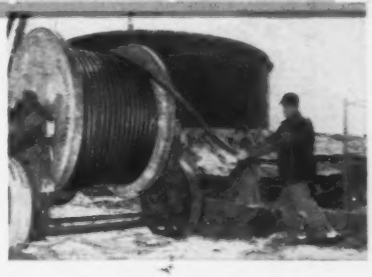
Speeds of 15,000 miles per hour and temperatures as high as 18,000°F. can be reached momentarily in a new wind tunnel being built to test missile nose cones.

"Silicone Insulation as Applied to Wire and Cable" is the title of a research paper by P. H. Ware of Simplex. This insulation is trade named "Thermoplex".

Flexible tanks of rubberized fabric are being made for use in the oil fields. They hold 15,000 gallons, but can be rolled into a package eight feet by two and one half feet when empty.

Kraft paper, shrunk after forming, is being used for shopping bags and multi-walled sacks. It stretches under tension and is said to be twenty per cent stronger than papers now in use for this purpose.

A portable scale that needs no pit is made for roadside weighing. It can handle vehicles sixty feet long weighing seventy tons.



Protection plus

C-L-X (sealex) is a continuous, lightweight, exterior metallic cable sheath recently introduced by Simplex. Impervious to gases, chemicals and water, C-L-X is ideal for almost any installation including aerial applications, industrial distribution and direct burial, as shown above. Practically any type of cable core can be used for such applications as power, control, signal and communication installations.

Other features include extreme pliability, ease of handling, long life, easy installation and relocation, and color coding for voltage or circuit identification.

SIMPLEX WIRE & CABLE CO.
Cambridge, Massachusetts and
Newington, New Hampshire

Simplex

Highest quality cables for: Mining
Power & Lighting • Construction
Transportation • Communications
Signalling

"The American manufacturers of transoceanic telephone cables"

Allis-Chalmers—25 Years

new

3-Phase POWER Regulators

Save 33% space...
30% cost...20% weight!

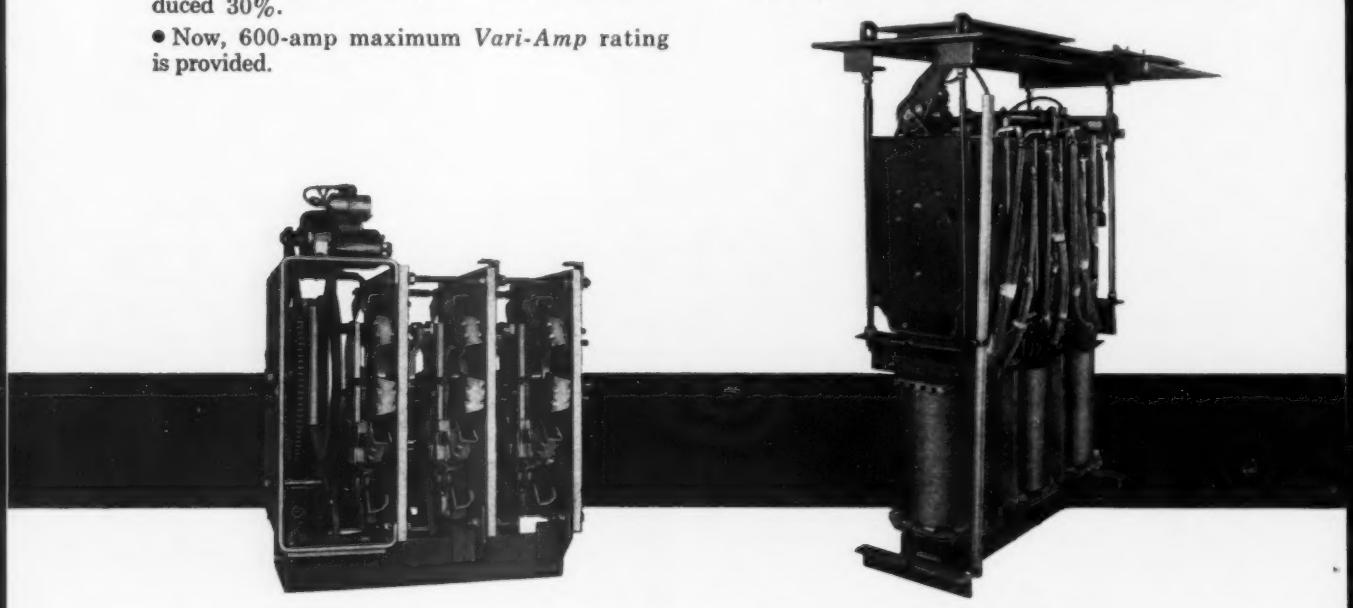
New design — new benefits to utilities are incorporated in the *NEW* Allis-Chalmers 3-phase power regulators.

- Now, substation space requirements for power regulators are reduced by at least one-third.
- Now, reduced sizes and weights for easier handling, lower installation cost.
- Now, cost per kva of 3-phase regulators is reduced 30%.
- Now, 600-amp maximum *Vari-Amp* rating is provided.

Available in most popular ratings

These new Allis-Chalmers power regulators are rated 500 and 750 kva, 8660 volts, and 500, 750 and 1000 kva, 13,200 volts.

These savings are so important it will pay you to re-evaluate your present substation planning on the basis of these new units. Check with your nearby A-C office or contact Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.

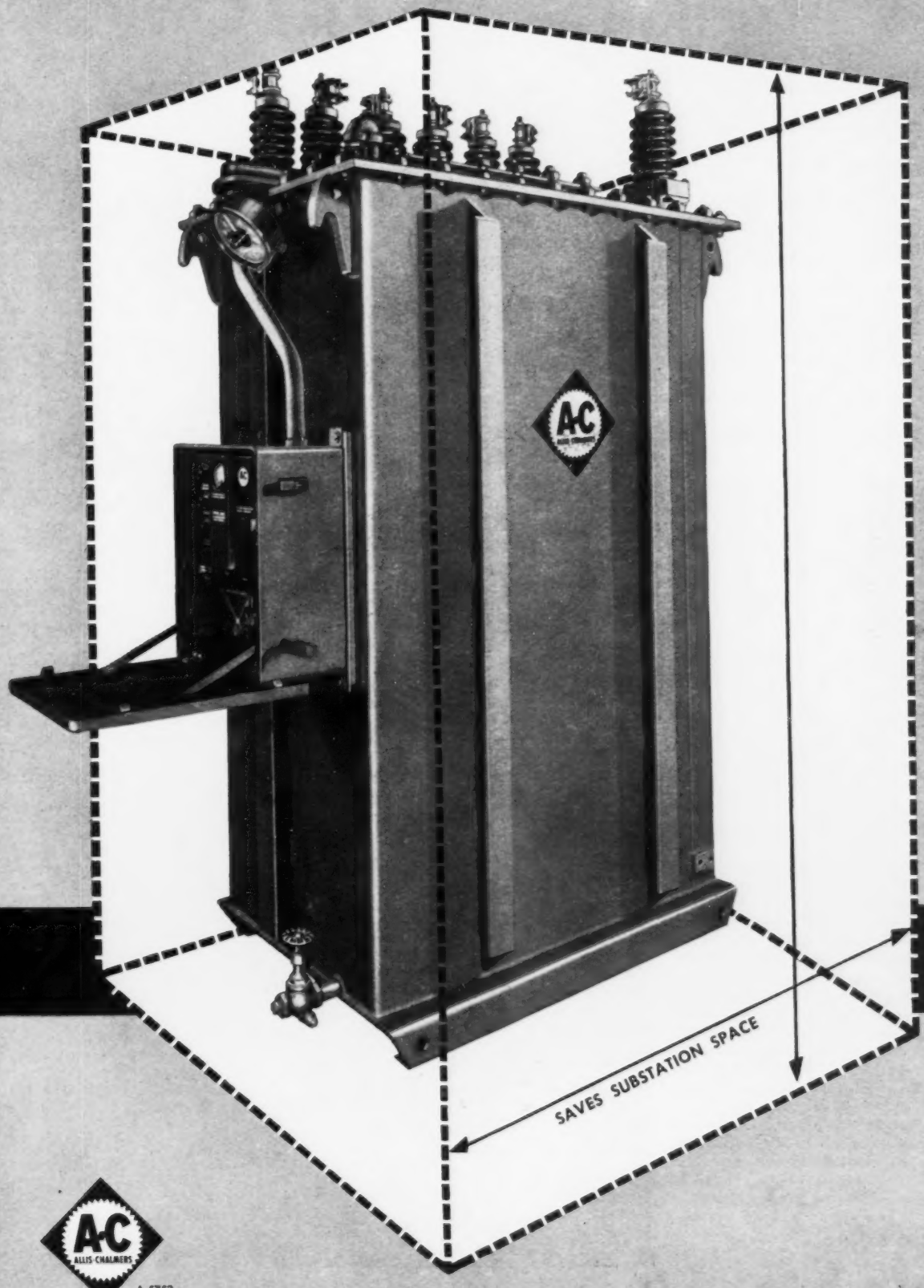


Heavy-duty tap-changing mechanism.

Unit construction combined with new space-saving arrangement of tap-changing mechanism.

ALLIS-CHALMERS

of Leadership in 5/8% Regulators



A-C ALLIS-CHALMERS

A-5752

news

This shows the approximate shape and location of the new, high Mountain Sheep Dam proposed by Pacific Northwest Power Co. as a substitute for the two-dam project denied by the Federal Power Commission. The dam would be 670 ft high and would be located three miles downstream from the original Mountain Sheep site. Plan gives five times storage. (Management)

Westinghouse Electric's Power Up Road Show has been touring the nation. A professional cast played 24 performances in the West. Here are Larry Mellert as cost accountant for the client; Hazel Mack, secretary, Ray Parker, architect, and Richard Everhart, engineer, at Maynard & Haines, who meet the problem head on. (See Manufacturers)

In cooperation with Arizona Public Service Co., students at Thomas A. Edison School at Phoenix are commemorating the 111th anniversary of the inventor's birth with Youth Science Day activities. The celebration is highlighted by an Edison exhibit—replicas of his inventions and many examples of old-time lighting fixtures, appliances and phonographs that will provide the basis for a permanent museum and exhibit. Part of the programs included presentation of a play entitled "The Man Who Turned Off the Dark" written by Jack L. McDonald, special services director for Public Service. One of the two youths who played Edison in the school play studies an old Edison phonograph and replica of the first light bulb. The exhibit has been named the "Edisonia Display"

Construction of Idaho Power's Oxbow is in high gear. Snake will be blocked at (1). Water is diverted to power house at (2). At (3) you see the power house location. At (4) is aggregate crushing plant. (Growth)

EW

Management

Another Try by PNP

Not daunted by the Federal Power Commission's refusal of a license for the Mountain Sheep-Pleasant Valley project, the Pacific Northwest Power Co. has now filed for a license application on a new Mountain Sheep dam about 3 miles downstream from the site of the initial Mountain Sheep project. The new structure would be 670 ft high and would provide 2,700,000 acre-ft of usable storage for power and flood control, thus negating the criticism of the two-dam project which would have had only 546,000 acre-ft for flood control and downstream benefits.

Ultimate capability of the new high Mountain Sheep Dam would be 1,520,000 kw. Preliminary cost estimates total $245,000,000 and the construction time is approximately four years.

This new proposal, upstream from the confluence of the Salmon River (important to fish interests), provides essentially all the benefits that would be obtained from the Nez Perce site favored by the Federal Power Commission but bitterly opposed by wildlife interests as it would be below the mouths of both the Salmon and the Imnaha Rivers, the former being a particularly important spawning stream.

► Another road block in Tacoma's path toward developing its Cowlitz River hydroelectric project takes the form of an initiative filed with the secretary of the State of Washington by the Washington State Sportsmen's Council. If passed by the legislature, or if placed on the ballot for popular approval, the measure would not only prevent the city of Tacoma from resuming construction on the project but would bar any PUD or private firm from taking over the $138,000,000 project.

► Utah Power & Light Co. has completed a contract with Idaho Power Co. for the purchase of 150,000 kw of energy from Idaho's Hells Canyon hydroelectric project. The power is scheduled to be delivered to the Utah system in the fall of 1961. E. M. Naughton, president and general manager of the Utah utility, reported that the favorable costs of power thus obtained will defer construction of the next generating plant by the Utah system for approximately two years. Utah's new generating facility will be a thermal plant at Kemmerer, Wyo., scheduled to go on the line in the fall of 1963.

Strike News

A three-week strike of 1,500 electricians which has tied up electrical construction work in the lower British Columbia mainland ended with a joint union-management decision to let judicial arbitration settle the wage dispute. The British Columbia Electric Co. and the IBEW will consider binding a ruling by the Chief Justice of the Supreme Court on wages, the main issue of the dispute.

The strike against the company and two subcontractors followed a unanimous award by a conciliation board of up to 19% wage increase over a two-year period. This was rejected by the union which sought up to a 40% increase. Linemen have been getting between $2.41 and $2.49 an hour.

► A week-long work stoppage by about 275 Puget Sound Power & Light Co. linemen ended April 4 with the men returning to their jobs on April 7. The men walked off the job in protest of the layoff of some 50 groundmen in recent months. The walkout was not authorized by the union and a spokesman for the linemen said they were not on strike but merely "attending meetings."

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Financial Notes

► Pacific Gas and Electric Co. needs about $100,000,000 in order to continue its growth program. Kenneth C. Christensen, PG and E's treasurer, told the Security Analysts of San Francisco last month that the company probably will schedule a common stock offering around the middle of the year — the offering to be made via rights. Issues of preferred stock and bonds are likely to be offered later this year or early in 1959.

The company's capital structure is now 49.4% in debt securities, 17.6% in preferred stock and 33% in common stock.

► Public Service Co. of Colorado is preparing to offer a $16,000,000 issue of cumulative preferred stock to take the form of 160,000 shares of $100 par value. The company's last offering of preferred stock was made in 1953.

► Puget Sound Power & Light Co. has filed an application with the Federal Power Commission for authority to issue $30,000,000 of first mortgage bonds and up to $10,000,000 of unsecured promissory notes. Proceeds from the bond sale would be used to refund $20,000,000 of first mortgage bonds (due 1987) and repay approximately $8,800,000 worth of outstanding bank notes. Proceeds from the promissory notes would be used to reimburse the company's treasury for construction expenditures.

► The Chelan County PUD of Wenatchee, Wash., retired more than $2,500,000 worth of revenue bonds ahead of schedule during the 14 months ending March 1, according to Manager Kirby Billingsley. The early retirements saved the PUD a total of $116,909 in interest and call premiums.

► California Electric Power Co. has received FPC approval of the price and interest rate on its proposed $12,000,000 worth of first mortgage bonds due in 1988. White, Weld & Co. bid the issue for a price of 100.559% of principal amount with an interest rate of 4½% per year.

With the Contractors

Oregon Groups Active

S. S. Adams was recently named president of the Oregon-Columbia Chapter, NECA, in Portland. J. A. McCoy was made governor, following his term as president. William A. Tindula was named vice-president; W. M. Graham treasurer. Other board of directors members are J. L. Krauser and Riley R. Taylor. Director for the Cascade Division is C. A. Vibbert; the Central Oregon Division Homer R. Smith; the Eugene-Springfield Division L. H. Morris and the Longview-Kelso Division Frank V. L'Amie. The association's special activities group has a program of selling and advertising to the residential market. Its efforts are being directed by Alexander & Associates and combines the efforts of 15 manufacturers and the NECA members to publicize housepower, adequate wiring, electric heat, adequate lighting, etc.

Highly successful meeting of members and nonmembers in the Eugene area was held in February to acquaint all with the NECA program. It was made a social affair as well, the wives of the members and guests being invited. W. R. Grasle, District 8 vice-president, S. S. Adams, president of the chapter, Herb Hagen, field representative, NECA, and Chapter Manager Robert Burns gave short talks. A job management course has just been completed in Salem, graduating 14, and meetings to demonstrate mechanical bookkeeping were being planned for April by J. A. McCoy, the governor.

► San Francisco and Peninsula electrical contractors, through the Joint Industry Board in cooperation with the Pacific Gas and Electric Co., have set up a Housepower Forum to prepare contractors to sell wiring modernization. Meetings are held in Colma, just south of San Francisco, and thus close both to the San Mateo and San Francisco participants.

► The San Francisco electricians' wage rate went up to a total of $4.25½ an hour. Effective June 1 an additional 12½c, it had been agreed last year, would be added but details as to how this should be applied were to be negotiated in March of 1958. It was decided to add it to the wage rate. The basic wage is $3.91 and fringes bring it up to the $4.25 rate.

► Earl Peak, Central Electric Co., San Francisco, who has been governor of the San Francisco Chapter, NECA, for several years, resigned the post and William A. Langlais, Charles A. Langlais Co., was appointed in his place. The annual dinner dance of the San Francisco association was announced to be on May 17.

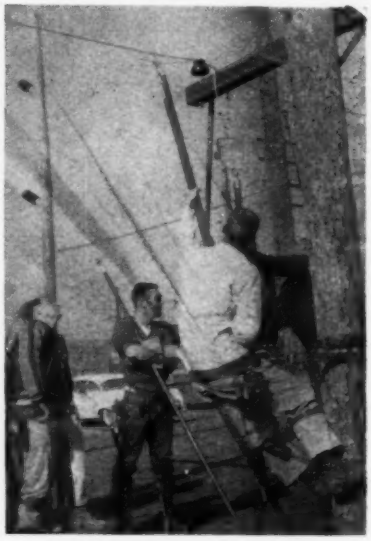
► Rudy D. Beard resigned as governor of the Northern California Chapter, NECA, when he resigned from the Scott Buttner Electric Co., of which he has been a vice-president and former general manager. He has announced no future plans as yet.

► Santa Clara-San Benito Chapter, NECA, moved its long-time location at 83 Bassett St., San Jose, to a new building erected by one of its members, Joe Santora, at 483 Auzerais Ave., San Jose, George Harter, its manager, announced. Also announced was that Robert Maxwell, retired city electrical inspector, San Jose, has been engaged to work for the Joint Industry Board of NECA and IBEW in the Santa Clara-San Benito Chapter area.

► Re-elected to his 15th term as president of the San Joaquin Valley Chapter, NECA, was J. E. McCarty at its recent annual election dinner. A. J. Massa was named vice-president, John Nomellini secretary-treasurer and Glen Bockmon governor. George W. Flint was reappointed secretary-manager.

► A new chapter in Nevada has been established at Reno. George B. Hughes is its president, F. E. Stanton its governor. J. C. Maytnier is its manager. It is independent of the former Nevada Chapter at Las Vegas, which is still the major chapter of the state. D. A. Farr is its president, L. J. Reynolds Jr. its governor and H. E. DeVilliers was named as manager.

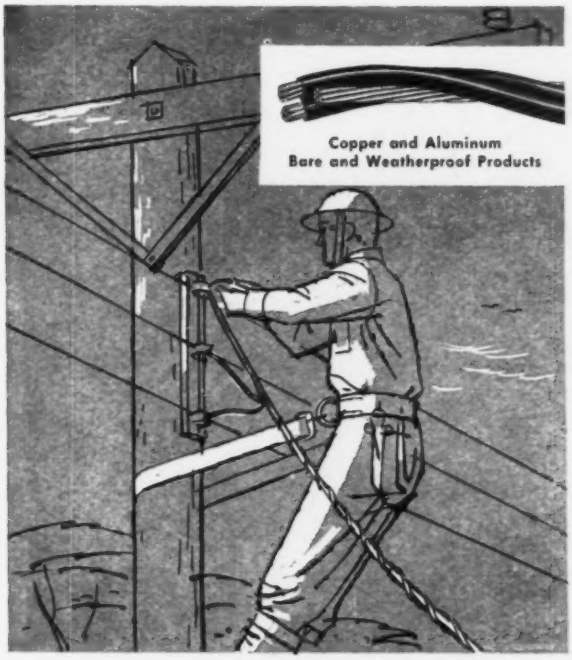
► George Curran, Red Top Electric Co., Oakland and Hayward, was recently elected president of the Bid Depository of California at its annual meeting. This swings the leadership of the Bay area bid depository to the East Bay where a separate office was established last year. The depository territory now includes Contra Costa, Napa and Solano Counties as well as San Francisco and Alameda Counties. Arthur E. Rowe is custodian.



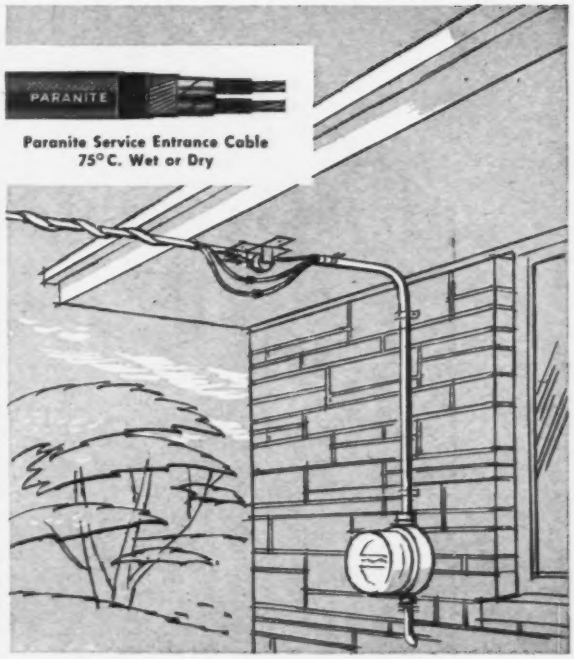
Hot Stick Training

Hot line tool work was demonstrated to the apprentices taking the line apprentice courses of the Northwest Line Constructors Chapter. Jim Dolan of the Safety Live Line Tool Co. made the demonstrations at two sessions, one in Portland and in Pasco. Pole top resuscitation was demonstrated in Spokane and drew so much public attention it caused a traffic jam. The classes are being conducted by Jim Condon and Bob Madaris in Portland, Seattle, Spokane and in Pasco. Although attendance has dropped because of employment, some of the apprentices are keeping up their work by correspondence, for which they will be given credit. Both contractors and union are asked to cooperate to round out the training and to try to dispatch the apprentices where they will get additional training. Doug Ellis is coordinator of the program.

► A foreman's institute was organized by the Inland Empire Chapter of NECA, Spokane, using the NECA job management material and condensing it to a five-day, all-day short course, with "bull sessions" at night. The emphasis was on personnel management and on work methods. Dr. Richard F. McMahon, dean of the School of Economics and Business Administration, Gonzaga University, was directing the course for the contractors and permanent foremen of their shops. Specialists from various branches of the industry were called upon to assist at the sessions where needed. Interest in a reading course has been expressed and a 10-hour course of that type is being planned, according to Robert Wilkinson.



Copper and Aluminum
Bare and Weatherproof Products



Paranite Service Entrance Cable
75°C. Wet or Dry

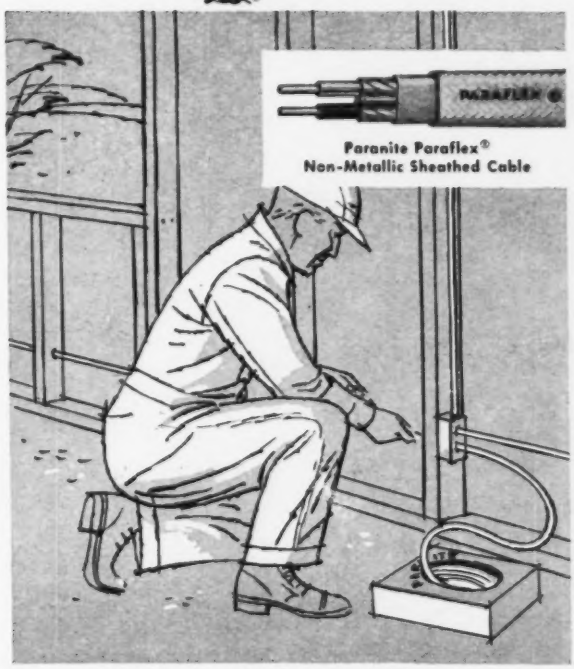
From Source to Service with PARANITE®

PARANITE WIRE AND CABLE DIVISION

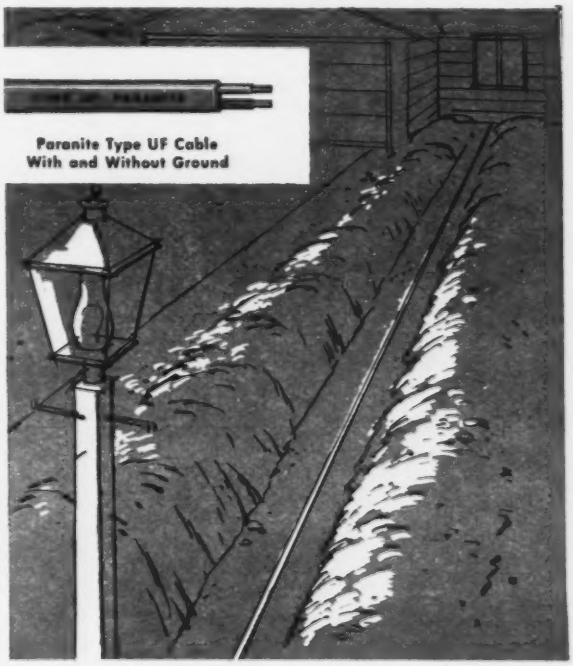
Essex Wire Corporation

FORT WAYNE 6, INDIANA

MANUFACTURING PLANTS: Birmingham, Alabama; Anaheim, California; Jonesboro, Indiana; Marion, Indiana; Tiffin, Ohio



Paranite Paraflex®
Non-Metallic Sheathed Cable



Paranite Type UF Cable
With and Without Ground

Sales Offices in all Principal Cities . . . Sold only through Recognized Electrical Distributors

Panelboard planning

helps Power-Up State Office Building

The new Commonwealth of Pennsylvania Office Building in Pittsburgh exemplifies the type of planning that powers-up today for future needs.

More than 40 Westinghouse Panelboards (Type NLAB & Type CDP) provide for lighting and distribution system protection and service continuity completely adequate for today's demands, and readily capable of expansion or modification to meet tomorrow's ever-increasing electrical needs.

OWNER—General State Authority, Commonwealth of Pennsylvania
ARCHITECT—Altenhof and Bown
CONSULTING ENGINEER—Carl J. Long
ELECTRICAL CONTRACTOR—E. C. Ernst, Inc.
WESTINGHOUSE DISTRIBUTOR—Keps Electric Company

J-93542

Westinghouse CDP Panelboards installed in the new State Office Building to provide protection and control of power circuits. Shown on wall at left is one of the Type NLAB Panelboards which protect building lighting circuits.

YOU CAN BE SURE...IF IT'S Westinghouse

Political Fronts

Drive on the Snake

Oregon politicals still stage a rear guard action to support Oregon's Senator Morse's attempt to get a high Hells Canyon Dam and drive the Idaho Power Co. off the Snake River. A blow-by-blow account of the hassle begins with the Oregon Water Resources Board's recommendation last January for a continuous study of Snake River alternate projects and a request to the FPC for suspension of any licenses which would interfere with the maximum economic project development. Based on this stand, Oregon's Public Utility Commissioner Morgan denied a subsequent application by Idaho Power Co. for the sale of $20,000,000 in securities. Immediately thereafter the Oregon Water Resources Board met and by a three to two decision refused to rescind its earlier stand.

Idaho Power's president, Tom Roach, commented on these actions as follows: "It would appear that this is but one more step in the long continued effort of certain persons in Oregon to assert the supremacy of that state over the United States constitution and laws and the Federal Power Commission. In a previous attempt by certain Oregon officials to stop construction of our Snake River projects, the Supreme Court of Oregon held specifically that the statutes of that state do not authorize state officials to attempt to veto a federal license or by an action of this kind to indirectly prevent the construction of a federally licensed project. Since both the United States Supreme Court and the supreme court of the State of Oregon have upheld our right to proceed, it is our opinion that this order will not affect the financing and continued construction of our projects. It is of more than passing significance that the company has obtained its financing authorization from the Public Utilities Commission of the State of Idaho, where more than 92% of our business originates and our customers reside."

The Oregon PUC threatens legal action if Idaho Power goes ahead with the sale of the securities.

► The taxation of municipally owned electric plants is scheduled for a court test in Wyoming. Attorneys for the state and 12 Wyoming towns have agreed at a pretrial conference to narrow their battle to the determination of whether or not city-owned power plants are used for "governmental purposes."

The 1957 Kwh Rodeo Winner

C. W. Leihy, Electrical West | R. V. Jones, PG and E | Harold Anderson, PG and E

Above: R. V. Jones, center, division engineer, PG and E, Fresno, Calif., receives his stock and dividend check from "Brodie" Leihy of Electrical West as PG and E's "Pete" Anderson looks on. Left: The prize—11 shares of Hawaiian Electric stock plus a $21 dividend check. Who Will Win It Next Year?

To ELECTRICAL WEST's Kilowatt-hour Contest Editor
68 Post St., San Francisco 4, Calif.

Here's My Forecast

The annual kilowatt-hour output for the 11 Western states for the year 1958 will be ..... kwh.

Here's why (in 25 words or less). .....

Name .....

Title or job .....

Company .....

Address .....

City ..... State .....

(Return before June 30, 1958)

Announcing

The 2nd Annual Load Forecasting Contest

West's Kilowatt-hour Load Forecasting Rodeo

A Chance To Put Your Brand on a $500 Block of Stock of a Western Utility

The Object — To forecast the total kilowatt-hour output of the power stations in the 11 Western states for the year 1958, giving reasons for the estimate in 25 words or less. Federal Power Commission figures of kilowatt-hour output will be the final authority.

The Contestants — Any person employed in any segment of the electrical industry in the 11 Western states, Hawaii or Alaska may submit one entry in the contest—using the attached postcard or a reasonable facsimile thereof. Entries must be postmarked not later than June 30, 1958. Employees of the McGraw-Hill company and its subsidiaries are ineligible to participate.

The Prize — ELECTRICAL WEST will award the winner, who comes closest to the actual official FPC kwh output figure, $500 worth of common stock in one of the electric companies serving an area of the 11 Western states. The electric utility whose common stock will be the prize will be determined by a drawing held at the annual Pacific Coast Electrical Assn. convention in Coronado, California, May 14-16, 1958. Stock representing the prize will be purchased immediately after the drawing and held in escrow with any accrued dividends until the winner has been determined. In case of ties, the prize will be divided equally between those submitting the winning figure.

A Hint — In 1957 the official kilowatt-hour output figure for the 11 Western states was 120,631,866,000 kwh as reported by FPC.

It's Fun — It's a game of skill — **and a test of your optimism about Western growth. Calculate what this figure will be for 1958! It costs nothing to enter the contest. Just send in your estimate on the attached card, by letter or other postcard.**

To ELECTRICAL WEST's Kilowatt-hour Contest Editor

Here's My Forecast

The annual kilowatt-hour output for the 11 Western states for the year 1958 will be ..... kwh.

Here's why (in 25 words or less). .....

.....

.....

.....

Name .....

Title or job .....

Company .....

Address .....

City ..... State .....

(Return before June 30, 1958)

Put Your Brand on $500 of Stock

Use this Card to Enter

ELECTRICAL WEST'S

—Kilowatt-Hour Rodeo—

See preceding page for full details

Postage Will Be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

Electrical West's Kilowatt-hour Rodeo
68 Post Street
San Francisco 4
California

In town or country . . .

street lighting with General Electric's

POWER GROOVE LAMPS

makes everybody look good

. . . especially the engineer who recommends them!

New G-E Power Groove fluorescents give twice as much light for safer night driving as the same number of ordinary fluorescents. What's more, they provide seeing comfort with natural color rendition. People look like people—and that's good.

There's a big savings in original cost, too, and a continuing savings in maintenance expense for equal light. This makes *everybody* look good!

WHEN YOU PLAN YOUR HIGHWAY LIGHTING AROUND G-E POWER GROOVES:

1 You get more light from the same number of lamps and luminaires, or

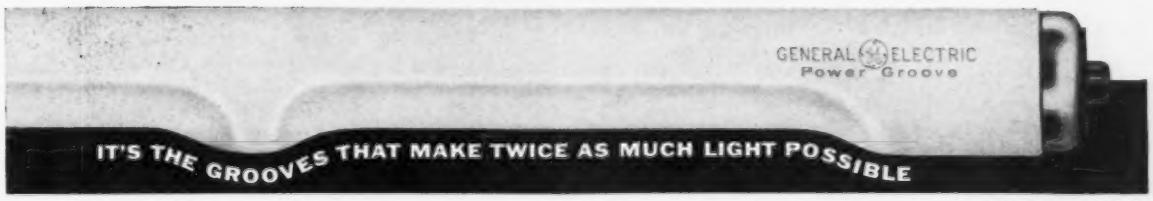
2 You use fewer lamps and luminaires and get equal light, or

3 You use the same number of shorter lamps and luminaires and get equal light.

G-E Power Grooves provide good roadway visibility, especially on wet pavement. So use them for parking and service areas, toll plazas, tunnels and underpasses, and on main or arterial highways through cities and towns. For more information on G-E Power Groove fluorescents or mercury lamps for street and highway lighting, write: General Electric Co., Large Lamp Dept. C-828, Nela Park, Cleveland 12, Ohio.

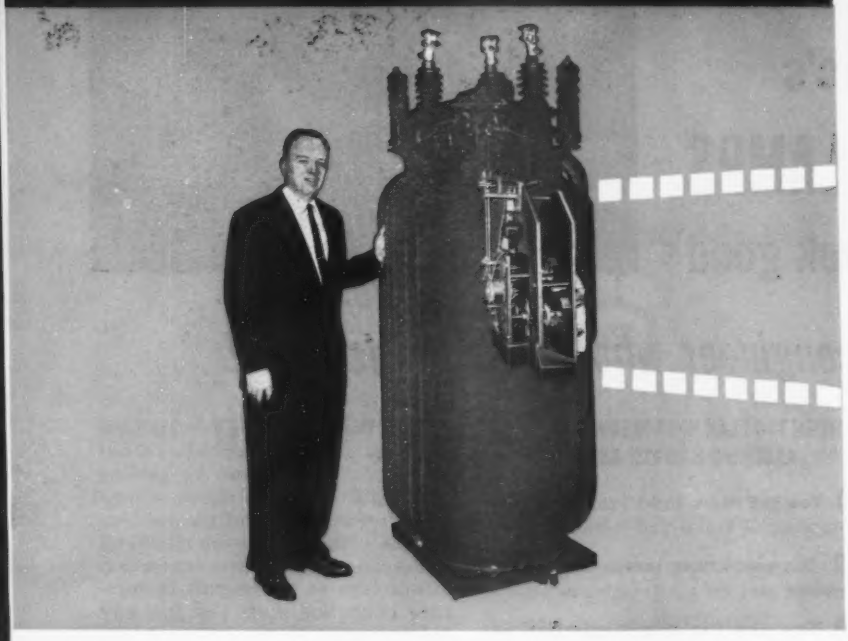
Progress Is Our Most Important Product

GENERAL ELECTRIC



Ask your
Westinghouse representative
about the exclusive benefits
you get from

URL AND URF
REGULATORS...WITH THE
TAP CHANGER THAT'S
15 TIMES FASTER



Westinghouse URL and URF regulators are equipped with a direct-drive Geneva gear tap-changing mechanism. The motor-driven mechanism operates instantly when a tap change is called for, thus taking advantage of the inverse time characteristics of the computing type CVR relay control.

This direct-drive mechanism corrects voltage 15 to 20 times faster than any spring-driven mechanism. Because there is no wind-up time, full-range operation requires a maximum of only 13 seconds, compared to 3½ to 5 minutes for other drives.

Elimination of this unnecessary time delay allows a 1½-volt correction in only 1 second, assures a narrower effective bandwidth, with better voltage control and improved customer service.

See your Westinghouse representative for the full story of better regulation—made possible through PLOWBACK OF EARNINGS into research . . . to help solve the immediate and long-range problems of the electric utility industry.

J-70860

YOU CAN BE SURE...IF IT'S Westinghouse

Growth

► Pacific Power & Light Co. has started construction of a 115-kv transmission line across the Columbia River to replace a 95-kv submarine cable linking PP&L's Merwin project on the Lewis River in Washington with the Portland service area. The two-mile crossing will be supported on seven towers — two of them 485 ft high.

► Cochrane Dam, Montana Power's newest on the Missouri River, produced electricity for the first time March 24. The $10,000,000 dam will produce 60,000 kw from two generators. The dam was named for H. H. Cochrane, chief consulting engineer of the power company.

► English Electric Export & Trading Co. Ltd. has won an additional $5,500,000 contract to supply hydro turbine generating sets for the Priest Rapids power project on the Columbia River. The two turbines, each 83,000 kw, will bring English Electric's share to some $25,000,000 for the Priest Rapids project.

► A $100,000,000 five-year construction program will be required by Bonneville Power Administration to provide transmission facilities for new generation scheduled in the Pacific Northwest through the year 1963, according to Dr. William A. Pearl, Bonneville administrator.

► Subject to REA approval, the Tri-County Electric Assn. directors have accepted a low bid for the construction of 30 miles of 69-kv transmission line and 240 miles of distribution line in Wyoming.

► Drilling crews have been sent to the Rocky Mountain trench area in northern British Columbia to test proposed dam sites for the Wenner-Gren hydroelectric development program. The proposed 3,000,000-kw hydroelectric project is expected to cost between $400,000,000 and $600,000,000, and involves a dam or series of dams east of Finlay Forks on the Peace River. Damming of the Peace River would create a 260-mile-long storage lake.

► May 24 has been set as the dedication date for the famous Pelton project of Portland General Electric Co. The 120,000-kw installation was constructed by Guy F. Atkinson Co. on the Deschutes River. An outstanding feature is its fish ladder.

Market Development

Calling All Cooks

Idaho Power Co.'s "Best cook in town" promotion had its start in Caldwell and Buell, where it made friends as it promoted electric living.

Sponsored jointly by the company and the local newspaper, the women's clubs are invited to nominate a candidate for the best cook in town. Nominations are then voted on in sponsoring stores, which may consist of electrical dealers and all other types of retail outlets in the town.

When the winner is elected, the club sponsoring her gets $50 for its treasury, while the individual winner receives an electric mixer.

The awards are made at a company cooking school, giving the utility home service department an opportunity to demonstrate electric cooking and participating dealers a place to display appliances, get prospects and make sales.

In Caldwell, where 32 women's clubs entered candidates, the event was so successful that James McCreight, Idaho Power's district manager there, was named "man of the month" by his fellow citizens.

Similar events are being set up for every major town in Idaho Power territory under direction of Vic C. Goertzen, sales promotion manager for the utility.

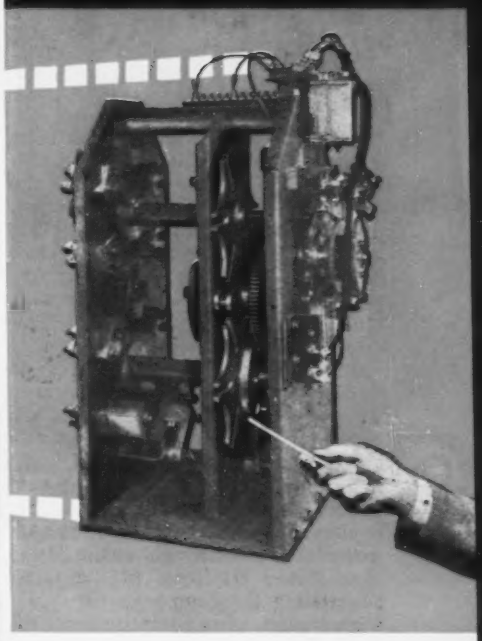
► Idaho Power and Al S. Gilbert, sales manager, picked off an Electri-Living Home Award for 1957 in the Living for Young Homemakers building program. This home, which was built in Boise by Ralph R. Sherman, received the first Gold Medallion in the United States. In the company's promotion of the Medallion Homes, 31 builders have signed up to build Medallion Homes in the company territory.

► On May 7 and 8, Humboldt Appliance Dealers Assn. will put on a new version of its Homemaker's Holiday at Eureka, Calif., Municipal Auditorium, according to Bernie Williams, secretary-treasurer. A special newspaper section 10 days in advance will call attention to prizes offered by participating dealers, carry coupons that must be filled out and deposited in a participant's store to make the reader eligible to win.

San Diego Gas & Electric Co. received first award for distinguished achievement in the 1957 Electri-Living Home program conducted by the magazine Living for Young Homemakers. Here Ralph J. Phillips, vice-president in charge of sales for the utility, shows the award to Stanley C. Scott, builder, and C. J. Paderewski, architect. The home has a push-button kitchen; heat pump, full housepower

EXCLUSIVE DIRECT-DRIVE GENEVA GEAR MECHANISM...

* No shock
* Fast arc extinction
* 15% less contact erosion



The exclusive direct-drive Geneva gear tap-changer mechanism in URL and URF regulators provides a sinusoidally controlled motion which:

- Changes taps smoothly, with no mechanical shock to loosen components.
- Provides correct speed for arc extinction.
- Reduces contact erosion by 15%.
- Permits 1¼% steps, which improves regulation and cuts maintenance.

J-70859

YOU CAN BE SURE...IF IT'S Westinghouse

TRADE confusion for convenience and more comfort
Get Rid of Outgoing Modernize Your Wiring
ANNOUNCING...
Montana Power's Time Pay Wiring Plan Is Now Available to Missoula Area Residents
The Montana Power Company

Full page ads like these are telling users about electrical living in a concentrated industry effort on one theme at a time

In Montana, It's Electrical Tuesday

Electrical Tuesday, advertising campaign of Montana Power Co., puts into effect the theory that the whole electrical industry, concentrating on the same selling theme at one time, will produce more sales than the same amount of advertising and promotion applied by the several units of the industry separately. The program, developed by D. J. McGonigle, general sales manager of Montana Power, had its kickoff March 4 and will be continued on the first Tuesday of every month through 1958.

The kickoff was a full-page general advertisement sponsored by dealers, contractors, distributors and manufacturers throughout the Montana Power territory, plus a page advertising the company's time pay wiring plan, plus advertisements of individual electrical firms in the principal papers of the four major cities in company territory. This all added up to 171 ads totaling 7,564 column inches in nine papers.

The second electrical Tuesday, April 1, featured dishwashers and waste disposers on the industry page sponsored by Montana Power and supporting manufacturers and distributors. At the same time, all dealers and wiring contractors were urged to utilize the day's newspapers to tell their own stories of the goods and services they offer, whether or not they sell the two featured appliances.

Other appliances will have their turn on succeeding first Tuesdays in this electrical industry campaign to promote the theme, Live Better Electrically.

► San Diego's Spring Fair of Modern Home Ideas opened April 22 for six days in the Electric Building at Balboa Park. Sponsored by the Bureau of Home Appliances, this perennially popular show will have a new feature this year, a Parade of Kitchens, including a Medallion Home and Housepower House. There will be more than 100 exhibits, Clark Chamberlain, bureau manager, reports.

PGE Housepower Bonuses

A new load building promotion tied into the Medallion Home idea has been set up by Portland General Electric Co. to run May 5-July 5. The program will promote adequate wiring and added appliances in existing homes through the offer of "Housepower bonuses."

The company will offer $40 to the owner of any existing home on its lines that purchases and installs an electric range, electric water heater or a clothes dryer and, in addition, will install service entrance capacity to accommodate 200-amp conductors.

To those homeowners who will purchase one of these major appliances, install 200-amp entrance and bring the house wiring, lighting and equipment up to full PGE Bronze Medallion Home standards, the company will award a bronze Medallion Home plaque, plus a housepower bonus of $75.

With the promotion go window banners, counter cards, bill stuffers, other promotional media for participating appliance dealers, and electrical and plumbing contractors. All appliance sales, of course, will go through dealers.

SMUD Tells and Sells

For the sixth straight year Sacramento Municipal Utility District will sponsor a contest designed to promote the sale of electric ranges. It will run from April 15 to June 1 and will feature a give-away of 10 name-brand electric ranges to the public and some special salesmen incentives.

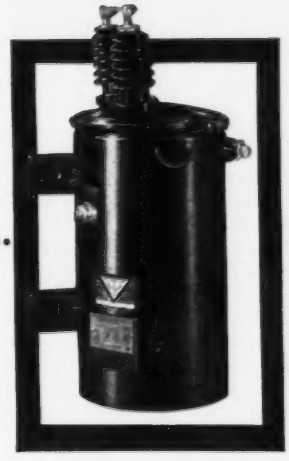
While the general plan is the same, this year's contest will have two innovations — both designed to increase selling power: (1) entry blanks will ask pointed questions on electric cooking, forcing those who do not know the answers to find them; (2) entries must be deposited at dealer stores, cannot be sent through the mail.

Still another current SMUD promotion is designed to educate the public on the benefits of electric cooking. In cooperation with manufacturers, distributors and dealers, the utility is offering 10-day free trials of electric frypans to Sacramento area housewives.

This offer is being made at 16 district sponsored cooking schools, where participating dealer or dealers "sign out" the frypans.

It is felt that many who take advantage of the offer will be cooking for the first time with electricity and the experience will convince them of the benefits of owning a frypan or, even better, may induce them to buy an electric range.

plan for the future plan to use RT&E Dual Voltage Transformers NOW!



up-rate system voltages

faster, easier, more economically

You can now look ahead and plan, with complete assurance, a relatively simple and economical way to increase system voltage. The development of the R T & E Dual Voltage Transformer makes this advance planning possible. You save on stocking, since one unit takes the place of two. You save on obsolescence when system voltage is uprated. Save on personnel needed for cut-over work.

Externally operated primary voltage change-over switch means instant voltage change, saving down time and labor time. No tank opening required, no bolted connection changes. No interruption of service; you cut over larger areas faster.

Available with all primary voltage combinations: 2400 x 4800 volts, 2400 x 7200 volts, 7200 x 14,400 volts, 4800 x 14,400 volts. Or custom designed to meet special voltage requirements. Prices for the R T & E Dual Voltage Transformer are only slightly higher than conventional single voltage transformers.

RT&E CORPORATION

WAUKESHA, WISCONSIN • PORTLAND, OREGON

INDIANA STEEL & WIRE CO. Crapo Galvanizing MUNCIE IND.

Signs along the lines of *Crapo* GALVANIZED STEEL STRAND PERFORMANCE

For dependable performance . . . insist upon *Crapo* Galvanized Steel Strand. Superior tensile strength, combined with long-life, ruggedness and workability, makes *Crapo* Steel Strand first choice for guys, messenger and overhead ground wire.

The famous *Crapo* galvanizing process provides dependable protection for the steel, prolongs the expectant life of the strand.

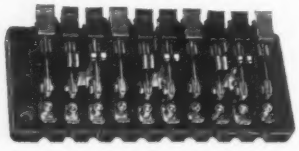
- Low maintenance cost
- Laboratory tested and controlled quality
- Meets highest quality standards
- A size and grade for all practical needs
- Contact your *Crapo* Jobber Today!

INDIANA STEEL & WIRE CO., INC.
Muncie, Indiana

YOU CAN ALWAYS DEPEND ON STATES TEST SWITCHES for performance, safety, value!

Many companies have standardized on States Test Switches because:

1. No live parts extend beyond base —an important feature.
2. Maximum pressure at jaw contacts.
3. Nickel corrosion resisting finish insures good contact and attractive appearance.

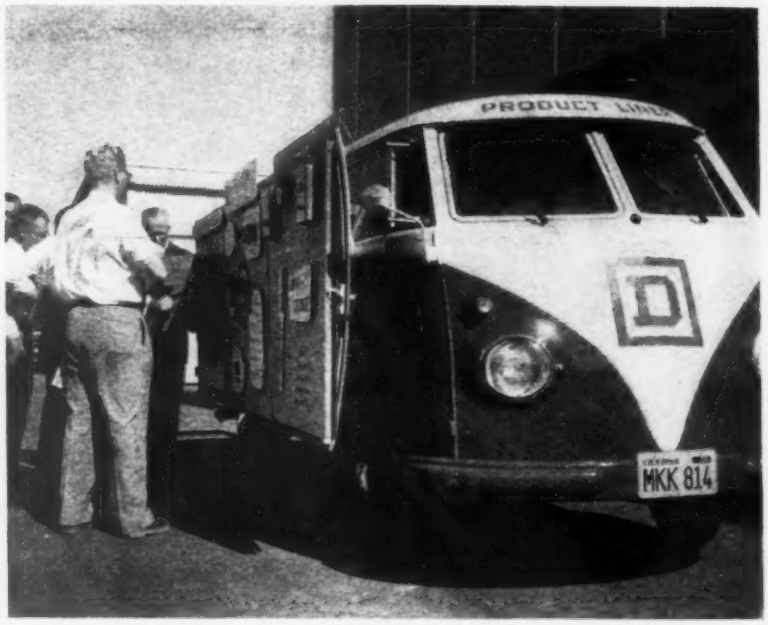


Plus
NEW SAFETY GRIP HANDLE in STATES TYPE "SMH" TEST SWITCHES

Provides easier, safer gripping. New handle mounted on States exclusive angle blade gives sufficient jaw contact.

GEO. E. HONN CO.
420 Market St. San Francisco
SUtter 1-7352

Manufacturers—Distributors



Interested personnel learn about equipment on their home ground as Square D . . .

Takes the Display To the Plant

Following a successful first run in the San Francisco district, Square D Product Liners have been put on the road in the Los Angeles, Seattle and Denver areas.

Each of the four Volkswagen Kombis has been outfitted with a collapsible three-panel unit that folds out along the curb side to give a 9x3½-ft display board. With a field engineer as host-lecturer, the display is taken to distributors and customers in a program designed for maintenance, operating and engineering personnel.

The accompanying picture, taken at California Research & Development's plant at Richmond, shows the first Product Liner in the fleet, put into operation in the San Francisco district about six months ago. This first display being viewed by industrial plant personnel, electrical contractors and engineers shows some little known features of the a-c magnetic starter. It will be followed by relays, including special application types that, until the time of the Product Liner visits, have been only photographs in the catalog to most of the viewers.

Future displays will include details of fusible safety switches, motor control accessories and circuit breaker panelboards.

The plan is to visit interested people about four times a year at 90-day intervals. The presentation takes about 20 minutes with plenty of time for a question and answer period.

Time to Power Up

Talking with a facile knowledge of the benefits of modern electrical equipment to meet the competitive challenges of the times, a young architect and an engineer, enacted by skilled actors, dramatized the Westinghouse Power Up program in 24 meetings in the 11 Western states.

It might be called selling from the inside out—the inside being the clients or their architect-engineer agents. As was Hamlet's father, the ghosts of their renowned forebears seemed exceptionally well informed when they held their boys to the quality line. Many in the audiences of contractors and salesmen wished that all architects and engineers were such staunch and well-informed supporters. They had them there as their guests in the hope of educating them. The smooth performance of the show troupe of four professional actors, aided by a revolving stage and a clever script, may well do so.

Joining Westinghouse Electric Corp. in sponsoring the 24 Western showings that began in Phoenix Feb.

25 and ended in Salt Lake City April 17 were the utility companies serving each area, Westinghouse Electric Supply Corp. and other agent distributors. In the San Francisco Bay area the joint industry boards of electrical contractors and unions also sponsored the event.

Together the sponsors invited plant owners, architects, engineers, management and supervisory people from industry and government agencies, fed them, and instructed them smilingly with the Power Up show. A follow-up card is now being sent to everyone who attended, inviting a call for a power survey or discussion.

► **Allis-Chalmers** has announced appointment of two new sales agencies in the West: **Picatti Bros.**, 105 S. Third Ave., Yakima, Wash., and **Love Electric** Co. of Tacoma. They will handle feeder voltage regulators, power transformers, unit substations, switchgear and circuit breakers.

► Retirement of **J. C. Setchell** from active management of its southern California and Nevada operations has been announced by **Garnett Young** & Co. He will continue as vice-president and director of the company, with administrative and consulting duties, according to Eric C. Kinsey, president. Richard F. Jordan of the Los Angeles staff has been advanced to divisional sales manager to take over executive responsibilities in the southern area.

► Appointment of **L. S. Reed** & Co. of Denver to represent **Sunbeam** Lighting Co. in the Colorado-Wyoming area has been announced by Henry Gluck, vice-president in charge of sales. Headquarters are at 1018 Lawrence in Denver.

► **Jack H. Wells** has been made a partner in the B. T. Heinz Co. at Seattle and firm name has been changed to **Heinz & Wells.** Benton M. Bangs, formerly with Graybar and G-E, has joined the organization as sales engineer specializing in mercury vapor floodlighting and electric heating.

► A new trademark suggesting the constantly varying relationships between viewer and light source has been adopted by **Lighting Dynamics,** according to Don Burns, West Coast general manager for Ekco Products, parent firm. Lighting Dynamics has two plants, one at 802 W. Whittier Blvd., Whittier, Calif., the other at 8700 Ambassador Row, Dallas, Tex.

wait a minute!

In photoelectric lighting controls, longer life and more reliability have been perennial concerns of both users and manufacturers alike for a number of years. Recently, however, there has emerged an unfortunately misleading generalization that tubes are THE big enemy, and once you get rid of them—presto—you automatically have a more reliable control.

Tubes give us the willies at times, too, but from what we've managed to learn after twelve years in this business, eliminating tubes is not an answer in itself, but only the approach. Very soon you realize that *to gain anything in the life and dependability of a control, you have to find something more reliable than tubes to put in their place.* Though not profound, this notion does not yet seem to be universally comprehended (e.g., gas tubes, motors, electrostatic relays, thermal relays and the like have not proved themselves in practice to be superior substitutes for vacuum tubes with established characteristics.)

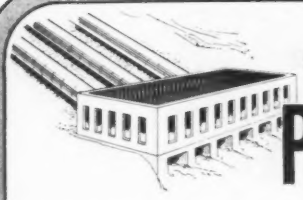
In our efforts along this line aimed at improved over-all performance, about 1500 F-P controls of a new design have been on test now for a little more than a year and a half. They're small, have four components and no tubes, and look very promising. But until we're sure that they'll continue to do a better job than the Series 63300C and 64400, we think customers are better off with these F-P "old standbys". When the new 6600 *is* ready, we'll spread the word around. In the meantime, if you run into any other tubeless controls, it could be to your advantage to find out "what went in when the tubes went out." The Fisher-Pierce Co., 43 Pearl Street, So. Braintree 85, Mass.

FP

FISHER PIERCE

PHOTOELECTRIC LIGHTING CONTROLS

AN AFFILIATE OF SIGMA INSTRUMENTS, INC.



FABRICATED STEEL

PENSTOCKS

FOR HYDRO DEVELOPMENTS

Location is one reason why Gate City Steel of Boise is the logical place to buy fabricated penstocks and other steel components for western hydro projects. Why not let us show you some other good reasons? Write:

GATE CITY STEEL

Box 1487 Boise, Idaho

Executive Offices: Denver, Colorado

Fabricating Plants: Boise, Idaho and Omaha, Nebraska

LABORATORY ENGINEERS & DESIGN ENGINEERS

B. S. Degree—Power Major. Experience in power equipment industry or equivalent. Lab Engineers must be experienced in high voltage testing procedures. Design Engineers must have 5 years experience min. Experience in the field of high voltage switchgear desirable but not mandatory if record proves design initiative and originality. NO ROUTINE WORK. Good knowledge of fundamentals and ability to take a broad view of problems essential. Work in Palo Alto or Santa Clara.

Apply—

Federal Pacific Electric Co.
5815 Third Street San Francisco, Calif.

Representatives Wanted

INTERCOMS—leading manufacturer of intercoms, door-answering and music distribution systems, seeks aggressive reps calling on electrical wholesalers. Box 295, Electrical West, 68 Post St., San Francisco 4, Calif.

MANUFACTURERS AGENT WANTED

The Adalet Manufacturing Company, Cleveland, Ohio, leading manufacturer of conduit fittings and insulating bushings, weather-proof and explosion-proof boxes and housings and vapor-tight lighting fixtures desires a representative for the Southern California area, headquarters in Los Angeles. Involves dealing with electrical wholesalers, contractors, architects, industrials and engineers. Arrangements for interviews will be made in Los Angeles. Write to:

The Adalet Manfacturing Company
14300 Lorain Avenue Cleveland 11, Ohio

The Western States and Hawaii represent 20% of your total market for electrical equipment and supplies . . .

For thorough advertising penetration of this rich market there is no better medium than ELECTRICAL WEST . . .

The best coverage and highest readership among Western

UTILITIES
CONTRACTORS
WHOLESALERS

► The **O. B. Wilt** Co. has moved from the Western Merchandise Mart at San Francisco to its own building at 934 Terminal Way, San Carlos, Calif. This company, which represents manufacturers of heating and cooling equipment, has an annual sales volume in excess of a million dollars; maintains branch offices at Seattle and Los Angeles. O. B. Wilt was with G-E for many years before starting the business.

► Ground has been broken in Billings, Mont., for **Midland Implement Co.'s** 72,000-sq-ft office-warehouse in the new industrial area. Carl A. Rahn is president of the firm, which distributes electrical appliances and equipment in Billings and Great Falls.

► **Tyre Bros. Glass** Co. has been made Pacific Coast distributor for Corning fluorescent lighting glassware. The Los Angeles firm is one of six distributors of the glassware in the United States and Canada.

► Two Western firms have been given **Waste King distributorships** recently: **H. R. Basford** Co., San Francisco (northern California), and **Tubbs Electric** Co., Spokane (parts of Montana, Washington, Idaho and Oregon).

► **Westinghouse Supply** has opened a distribution center in San Bernardino's industrial area at 720 College Drive. Paul Hamre, manager of the newly established branch, joined Wesco at Los Angeles in 1941, was at Sacramento for several years.

► **Air Cold Sales** Inc. is opening a branch at 1109 S. LaBrea, Los Angeles. This company recently invited 175 customers to a presentation of the colored sound film, *A Trip Through Bendix-Westinghouse*, held at its headquarters, 1327 S. Atlantic Blvd.

► **RT&E** has appointed these new representatives: P. H. Leathem, for the States of Arizona and New Mexico; H. L. Mooney, for the State of Oregon.

► **Hoffman Engineering** Corp. has appointed these West Coast representatives: Donal Co., Portland (State of Oregon and Boise, Idaho); Muth-Richards Co., Seattle (State of Washington).

► **Chase Brass & Copper** Co. has moved into a new warehouse and sales office at 230 Shaw Road in South San Francisco.

► **Westinghouse Electric** has opened two new apparatus sales offices in southern California. New quarters at 6451 Eastern Ave., Bell Gardens, are headed by Edwin C. Martinez. The new Van Nuys office, at 15217 Burbank Blvd., is under Arthur G. Kane Jr.

► **Electrical Products** Corp., manufacturer of neon signs, has started construction of a $120,000 plant on a two-acre site at 3530 S. W. Bond St. in Portland.

► **T. J. Vieau & Associates** has been appointed exclusive factory representative in the Denver area for **Columbia Electric & Mfg.** Co. of Spokane, Wash. The Denver firm is headed by Thorle J. Vieau, formerly district manager for Crouse-Hinds Co.

► Since the beginning of the year **Sierra Electric** Corp., Gardena, Calif., has appointed six new sales representatives throughout the nation. The **John Carder Jr.** Co., with warehouse facilities in Albuquerque, will service the states of New Mexico, Arizona, Colorado, Utah and Wyoming.

► **Hill & Deitrick** has been made factory representative for the C. A. Dixon Co. lighting line in northern California, all of Nevada, Idaho, Montana, Utah, Wyoming and Colorado. The company makes provincial and early American fixtures.

► **Ampere Industries,** maker of radiant heating units, has appointed these representatives: Wayne C. Wells, Portland; Cohn & Shane Inc., Los Angeles.

► Harald A. Larsen, formerly with White Sewing Machine Co. and lately having his own sales and service shop, Portland, has departed the Western mainland to become manager of Kirby Co. Ltd. on the island of Guam. The Kirby Co., established in Agana, Guam, is an electrical wholesaler distributing Frigidaire appliances, and is owned by Jack Sayre.

► A West Coast sales office is being opened at Burlingame, Calif., by **Sylvania-Corning Nuclear** Corp., fuel element producer with headquarters and plants in New York. According to Stanley B. Roboff, marketing director, the office is to meet the needs of the growing nuclear industry in the West. James O. Vadeboncoeur has been made marketing manager for the Western region.

Contractors and maintenance men

DEPEND ON ROYAL ELECTRIC

RUBBER JACKETED CORD

No doubt about it, the trusted name in portable cord and cable is ROYAL. Wherever dependability counts, you can count on the ROYAL line of Rubber, Neoprene, and Plastic Jacketed Cords — Machine Tool Wire — Thermostat Cable — and Heavy Duty "Powr-Kord" Extensions. Take advantage of Royal Quality Products in Quality Packaging for faster, easier, surer wiring. Catalog 4-54 gives complete details. Ask your wholesaler for a copy today, or write Royal Electric Corporation, Pawtucket, R. I.

Made RIGHT . . . to be right on the job!

ROYAL ELECTRIC CORPORATION
an associate of
International Telephone and Telegraph Corporation
PAWTUCKET • RHODE ISLAND

ROYAL ELECTRIC
AN ASSOCIATE OF
IT&T

People

B. C. Engineering Changes

British Columbia Engineering Co. staff changes announced recently include the promotion of Henry W. Smith from assistant general manager to general manager. Smith joined British Columbia Electric Co. in 1945 as a station design engineer, and became assistant to superintendent and assistant chief engineer prior to going with B. C. Engineering in 1956. In his new position he succeeds William G. Huber, who retired Dec. 30 but is continuing to serve as special assistant to the president.

R. M. Bibbs has been appointed assistant general manager of the engineering company, and H. W. Peck becomes executive assistant to the president. C. H. Maartman, former civil design engineer, is now design superintendent for hydroelectric projects. Harry M. Ellis was named chief of technical research, and R. C. Hausch and Fred J. Spook are staff engineers.

The engineering company is now in its new headquarters at Dunsmuir and Seymour Sts., Vancouver.

► **Veldon Carroll** has been named manager of the Arco office of Utah Power & Light Co. He succeeds **G. T. Parkinson,** who transfers to Vernal, Utah, as the firm's district representative.

► **Steve Chalmers** has assumed duties of supervisory engineer of the control and communications division of Salt River Power Project. His responsibilities include design and application of communications, supervisory controls, telemetering, relaying and testing. **Harold Hudson** has assumed responsibilty as supervisory engineer of the electrical design division. Duties include design and application related to substations, rotating equipment and general electrical installations.

► **R. Abramson** is now director of apprenticeship training for the Joint Committee in Sacramento. He has been president of the local IBEW, an instructor in the schools, and served as superintendent for some of the Sacramento contracting firms.

► **M. C. Phillips** has been named treasurer of Electro Engineering Works, San Leandro, manufacturer of electrical and electronic transformers.

► **Elmer B. Titus,** formerly manager of utilities at Ketchikan, Alaska, has been appointed manager of the Clallam County PUD at Port Angeles, Wash. He succeeds **Carl Miller,** who resigned last fall. Titus has been in Alaska for five years, after thirty years in Northwest utilities work. **William Fell,** PUD engineer, has been acting manager since Miller's resignation.

► **George F. Meyrick** has been named regional manager for Youngstown Kitchens in the Pacific Northwest. Jack R. Carl, formerly regional manager, has been transferred to Columbus, Ohio.

► **David F. Nock** has been appointed De Sabla Division commercial manager for Pacific Gas and Electric Co., with headquarters in Chico. He has been Coast Valleys Division commercial manager. Nock succeeds **Victor C. Novarino,** who in turn moves to Salinas to take over the post being vacated by Nock.

► **Theodore H. Jenner** has been named a member of the California Public Utilities Commission. He succeeds **Rex Hardy,** who resigned to accept appointment as a superior judge in Los Angeles.

► **J. G. Hart** has been appointed to the position of commercial engineer for California Electric Power Co. He has been with Calectric since 1949.

► **F. R. Bergseth,** professor of electrical engineering at the University of Washington, has been named to the State Board of Registration for Professional Engineers and Land Surveyors. He replaces **Earl Baughn,** whose five-year term recently expired. The new appointment covers the same period.

► **J. D. Worthington** was named chief civil engineer of Pacific Gas and Electric Co., to succeed **Carl W. Appleford,** who retired Feb. 28. Appleford had 38 years of service with the company.

► **Grant Bloodgood,** associate chief engineer of the Bureau of Reclamation at Denver, has been named assistant commissioner and chief engineer. **E. G. Nielsen,** presently assistant commissioner in Washington, has been named associate chief engineer.

► **Herb Schoenstein** has been assigned to Denver as electrical conductor representative in Colorado and Wyoming for Kaiser Aluminum & Chemical Sales. He succeeds **E. L. Bledsoe,** promoted to sales supervisor for Oakland, Calif., division.

► **R. H. Sullins** has been appointed switchgear specialist for the Rocky Mountain district of General Electric Co., with headquarters at Denver. He succeeds R. E. Shields, who moves to Philadelphia.

► **James Gedney** has been appointed Denver agent for Stromberg-Carlson Co. special products division. Gedney was formerly with Interstate Radio & Supply Co. of Denver.

►**Keene Atwood** has been named successor to the late William F. Freitag, office manager of the Yakima district of Pacific Power & Light Co. Atwood's successor as Walla Walla district office manager is **Howard S. Yeend. Horace L. Ouzts** is named Thermopolis district manager to succeed the late **B. O. Jackson.** He transfers from the Wyoming division office in Casper.

► **William R. Gould,** superintendent of steam generation for Southern California Edison Co., and **Charles G. Brent,** a project engineer with The Fluor Corp., have been appointed director and assistant director, respectively, of the newly formed maintenance and plant engineering division of the Southern California Section, American Society of Mechanical Engineers.

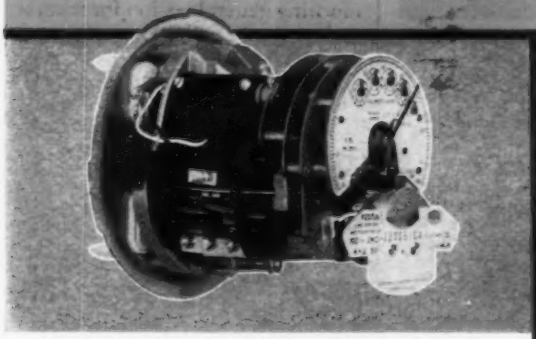
► **Eugene F. Bridler,** former chief operator at Davis Dam for the U. S. Bureau of Reclamation, has accepted the position of chief system operator for the Power Authority, State of New York, St. Lawrence Power Project.

► **Juan A. Petersen** was recently made Western regional marketing manager of Paragon Electric Co. with headquarters at Los Angeles.

► **R. G. "Spike" Kenyon,** Southern California Edison Co., and **C. M. Allen,** Los Angeles Department of Water & Power, have been elected vice-presidents of the Greater Los Angeles Chapter of the National Safety Council.

► **Clay Barton** has been named district sales representative in Portland for Smoot-Holman Co. He transfers from the Dallas office.

NEW... SANGAMO MECHANICAL DEMAND METERS



Sangamo's new two-stator four-wire delta meter with a Type D Mechanical Demand Register installed. Meter disk is readily visible from any angle.

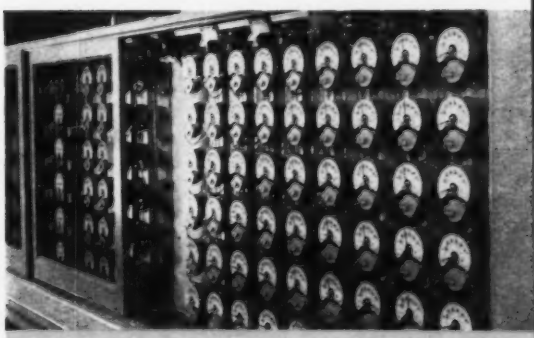
Type P2D

with a new concept in Mechanical Demand Registers

Sangamo's new Type D Mechanical Demand Register, when installed on any of the Sangamo Type P2 extended range watthour meters, accurately measures KW demand on all polyphase loads.

Universal and standard Type D Registers have—*full scale capacities* to match both Class 100 and 200 meters —time interval indicator—*clutch free* arrangement for disengagement of the timing motor with *no* mesh adjustment.

Trouble free service is assured by—the proven Sangamo slow speed, high torque timing motor—timing gear shafts with polished stainless steel pivots—permanently lubricated porous bronze bearings—jeweled and nylon thrust bearings—and Sangamo's field proven, clutch free gravity reset mechanism.



Every Type D Mechanical Demand Register is thoroughly tested for accuracy. This group of registers is being given time run tests in the Sangamo factory.

SM58-9

SANGAMO ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

Test-Proven for Superiority . . .

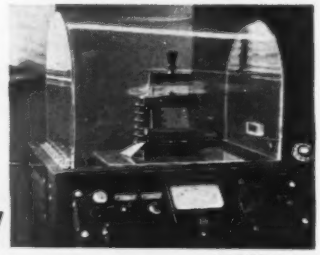
ACCURATE TAPES

FRICTION,
RUBBER,
PLASTIC

Send today for our most recent bulletin describing details.

TENSILE

ADHESION



DIELECTRIC

ACCURATE
MANUFACTURING CO.
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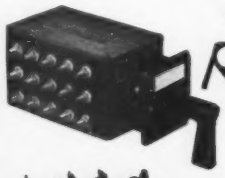

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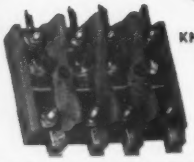

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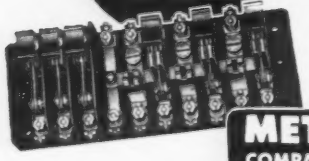

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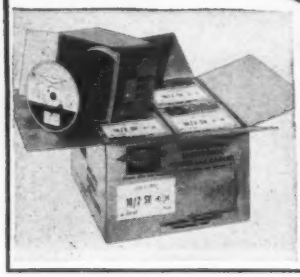

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Associations

NAED Golden Year

Appropriately the Golden Anniversary national convention of the National Association of Electrical Distributors will be held in the Golden West where 50 years ago electrical supply jobbers themselves originally organized. The NAED convention will be held in the city by the Golden Gate, San Francisco, June 8 to 12. Several thousand members, their wives and families have already booked reservations. Convention sessions themselves will be held in the Civic Auditorium where conference booth centers are being prepared for manufacturers in which to meet their wholesaler customers. There will be no exhibits as such, although many will have table-top displays of new things and literature.

The history of the association appropriately will be depicted in a skit at the end of the opening Monday morning general session for members and guests. The organizations that preceded NAED will be described and some of the historic events in the association re-enacted.

While the formal convention does not begin until Monday, a preconvention shirt sleeve clinic will be held for NAED members at the Mark Hopkins Hotel on Saturday, June 7, at 2 p.m. Registration for early arrivals will be conducted at the Fairmont Hotel lobby on Saturday beginning at 1 p.m. and throughout Sunday.

The board of governors' meeting will be Sunday at 10 a.m. Early arrivals will have tours of San Francisco available to them. Registration moves to the Civic Auditorium on Monday, where the first general session begins at 9:30 a.m. The convention will be welcomed by Mayor Christopher of San Francisco. Rev. John A. McGarrity of Old St. Patrick's Church, San Francisco, will pronounce the benediction. Speaker for the morning session will be Rt. Rev. Herman J. Hauch, president of Santa Clara University. Robert R. Gros, vice-president, Pacific Gas and Electric Co., is scheduled for another address. The skit will follow this.

Tuesday's program again in the morning will be opened by an address on management planning by Paul E. Orr. This will be followed by a group of panels whose theme is "Ideas for Profit." The session will close with the presentation of honorary life memberships.

Wednesday's program will be ad-

dressed by Dr. Edwin H. Lewis of the University of Minnesota Department of Marketing, and by A. P. McIlhenny, chairman of the Electrical Housewares Section of NEMA. He will make the annual housewares award of a plaque. The luncheon on Wednesday is for members only and will have the annual election of officers.

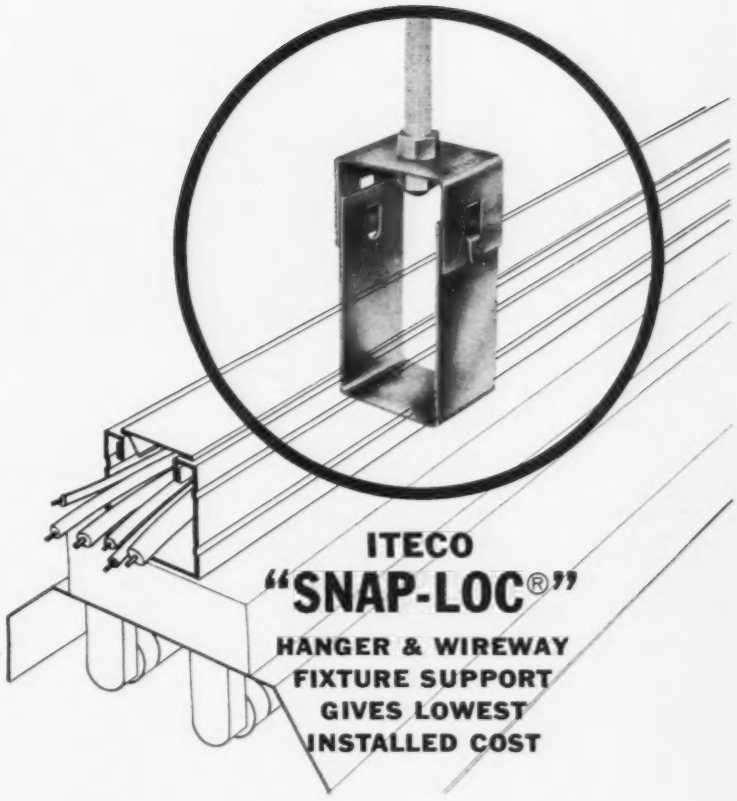
On Thursday, after a convention session for members only preceded by a breakfast and organization meeting of the board of governors, the group will be taken for a tour of the atomic reactor power plant of PG and E at Vallecitos.

Conference booths will be open for personal meetings between 2 and 5 p.m. each day, Monday, Tuesday and Wednesday. The annual dance for members and guests will be held Wednesday evening from 9 p.m. to 1 a.m. A full entertainment program for the ladies is being planned by the entertainment committee, according to William Jewell, Western regional manager of NAED, San Francisco.

► Special features planned for the Pacific Northwest Regional Conference of the Illuminating Engineering Society in Portland May 22 to 24 at the Multnomah Hotel have been announced by Walter Potter, general conference chairman. In addition to President Kirk Reid of IES and C. L. Crouch, technical secretary, W. H. Kahler of Westinghouse, W. P. Lowell Jr. of Sylvania, the Northwest meeting will hear the results of a year-long study in Seattle on daylight in schools. It will be presented by Beverly Travis, consulting engineer of Seattle. L. E. Ryan, city electrician, Vancouver, B. C., will discuss fluorescent street lighting in Canada. Chet Jarrett, Portland General Electric Co., Portland, will demonstrate the equipment and give the lecture on "Seeing Environment Through Lighting" which he presents to office groups. A speaker from Canada will discuss "Modern Lighting Trends in Europe."

► Beverly Travis, consulting electrical engineer, Seattle, is the nominee of the Pacific Northwest region for vice-president of Illuminating Engineering Society. James Barnes, PG and E, San Rafael, is the nominee for the South Pacific Coast region.

► Electrical Maintenance Engineers' Assn. of the Columbia Basin, Portland, elected Dick Drewfs as its president, Fred Bunnell vice-president at its annual meeting March 27. William Suckow has been president during the past year.



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Left to right: Conrad Ottoway, Milton Bunker, Robert Haskell, Robert Schwartz, Ed Page, Lloyd Gartner, Ed Spear.

► A close contest was decided on points by the judges at the Golden Gate Section, IES, runoff of the "My Most Interesting Lighting Job" contest March 27. With a high standard of entries the judges, mostly consulting electrical engineers, rated them very closely together before the final presentation. B. J. Sabaroff, architect, was chairman of the meeting. Contestants in order of their winnings were Robert Schwartz, United Ceiling & Lighting Co., and Ed Spear, G-E Lamp Division, for the relighting of the G-E Lamp Division's Oakland offices; Ed Page, architect, for the color engineering and lighting in the Fireman's Fund Building, San Francisco; Milton Bunker for the lighting of the Burlingame branch of S. Christian of Copenhagen, giftware and variety specialty shop; Conrad Ottoway, city of Oakland, for the relighting of the council chambers in the City Hall; Lloyd Gartner, architect, and Bill Ashton Jr., Columbia Electric & Mfg. Co., for relighting of a furrier shop on Post Street, San Francisco. The only residential entry was made by Robert Haskell, PG and E, who described the lighting of a model certified lighting home near San Francisco.

NCEB OFFICERS

C. W. Goodwin Jr., General Electric Supply Co., San Francisco, was re-elected president of the Northern California Electrical Bureau, at its recent annual meeting, according to announcement by B. W. Reynolds, bureau manager.

Stuart D. Paine, Thompson & Holmes Ltd., San Francisco, was elected vice-president; O. R. Doerr, Pacific Gas & Electric Co., secretary, and Henry A. Adams, Western Merchandise Mart, treasurer.

The executive committee follows: John S. C. Ross, PG and E, chairman; Ernest G. Kramm, NECA, Oakland; Donald D. Scarff, G-E, Oakland; P. L. Henry, Leo J. Meyberg Co., San Francisco; Vern A. Brown, Graybar Electric Co., San Francisco; C. W. Leihy, McGraw-Hill Co. of California, San Francisco; LeRoy Herbert, Oster Mfg. Co., San Francisco; H. L. Hussey, Phelps Dodge Copper Products Corp.

► Dan L. Turner, San Diego Gas & Electric Co. instructor, was elected president of the Electric Club of San Diego at its annual meeting, succeeding R. A. Kinslow, Westinghouse Corp. R. W. Rohrbach was named first vice-president and C. J. Nevitt second vice-president, D. W. Struck secretary-treasurer.

► Charles W. "Brodie" Leihy, editor and publisher, ELECTRICAL WEST, was elected president of the San Francisco Electric Club at its annual meeting in March. Directors elected were Gordon Black, Richard Frey, Ellis Larkins, C. C. Walker. Charles Huyck was re-elected secretary-treasurer.

► Schedule of meetings for the Southern California Chapter, IAEI, for the rest of the year was announced recently by C. D. Metzger, Long Beach city inspector, secretary-treasurer. The March 26 meeting was held at San Diego. May 21 will be at Santa Barbara, July 23 at Riverside, November 5 at Long Beach.

► Office of the Bureau of Home Appliances of San Diego County has returned to the Electric Building at 6th and E Sts., San Diego, in Room 406. Space has been made available again since many departments were recently transferred by San Diego Gas & Electric Co. to a new service center.

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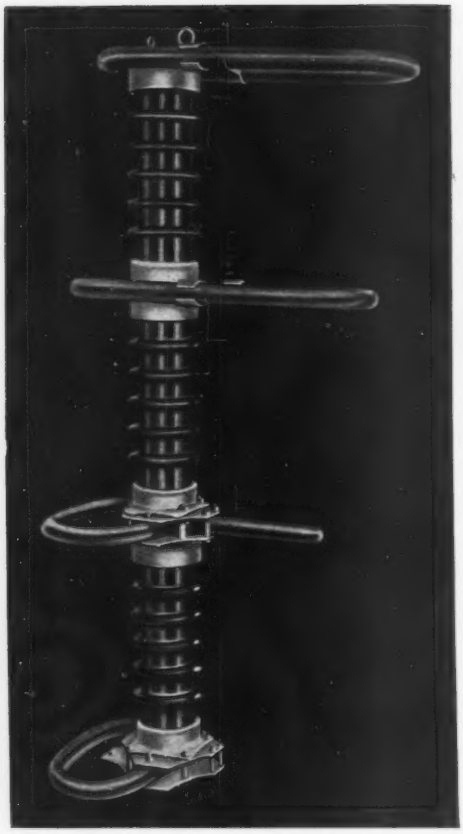

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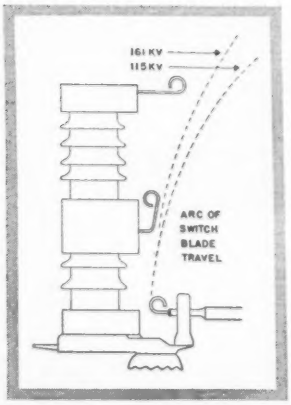

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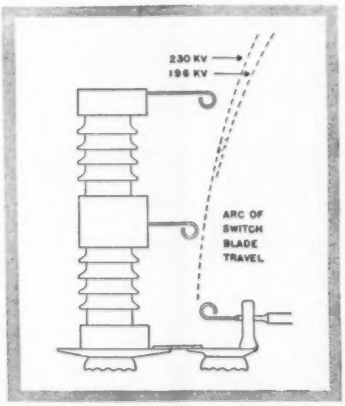

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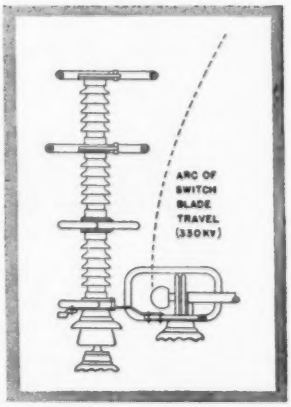

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